STEM Perspectives

ATTITUDES, OPPORTUNITIES, AND BARRIERS IN AMERICA'S STEM WORKFORCE

Brent Orrell and Daniel A. Cox

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AMERICAN ENTERPRISE INSTITUTE

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Executive Summary

STEM disciplines are often recommended as the most direct path between education and a good, high-wage career. From public policy to student career counseling, encouraging STEM credentials and degrees has been at the center of American educational, employment, and economic strategy for decades. The question arises whether we have gone too far in promoting STEM as a pathway to career success. What do current and former STEM workers think about the field in which they work?

In a new national survey, AEI examines how people with STEM degrees perceive the working conditions, opportunities, and barriers to success in STEM occupations. For STEM-credentialed individuals who either never worked in STEM or have left the field, we also explore their reasons for opting for other career pathways.

Like most workers, the survey finds that a strong majority of STEM graduates are satisfied in their jobs.[1] Relative to other degree holders, few STEM graduates regret their major choice,[2] and most are confident that the STEM field offers about the same or better opportunities than other fields do in pay, opportunities for advancement, ability to make a meaningful contribution to society, collegiality among colleagues, and more. Although there is some variation among subgroups, most current STEM workers do not seem concerned about the impact of automation or foreign competition on their jobs, and relatively few have seriously considered leaving the field. When asked if they would recommend a STEM career to a young person, 95 percent of STEM workers with a STEM degree said yes.

Some responses, however, provide cause for concern—especially for women, minorities, and workers with less than a bachelor's degree in STEM occupations. Over half of STEM degree holders say the statement "people feel like they are generally replaceable" describes the field very or somewhat well, and more than four in 10 say that employers would rather hire new workers than train current ones. Women are more likely than men are to regret choosing a STEM degree, and over 40 percent of STEM degree holders say women face more obstacles in STEM than they do in other fields. (Among female respondents, this number rises to over 50 percent.) Similarly, over 30 percent of all STEM degree holders say black Americans face more obstacles in STEM than they do in other industries (more than 40 percent of nonwhite respondents say the same), and nearly half of current STEM workers say older Americans face more barriers in STEM than they do in other fields.

The survey also examines who is leaving STEM and why. Among those who have left STEM during their working life, the most common reasons cited are a change in career interests or family responsibilities, while about four in 10 point to additional factors such as feeling undervalued, lack of competitive salary or benefits, and few opportunities for advancement. Women and associate degree holders are more likely to leave the STEM field than are their male or bachelor's and graduate degree-holding counterparts. There is at least some evidence that those with less than a bachelor's degrees are more likely to cite a lack of opportunity for advancement in the workplace and job elimination from automation as reasons for leaving the field.[3]

Consistent with recent literature, the survey finds that STEM workers identify noncognitive and interpersonal skills as important in their job, especially among female STEM workers and older workers who are more advanced in their careers. Nearly half of STEM workers say good written and communication skills are extremely important in their job, and nearly 70 percent say the same of critical thinking skills. By comparison, only 36 percent of STEM

workers said high-level math, analytical, or computer skills—generally thought to be core skills for STEM occupations—were extremely important in their job. Notably, the importance of noncognitive or implicit skills on the job increases as workers age, while the importance of technical skills remains relatively constant.

Findings in the survey will provide workers, employers, policymakers, and concerned citizens with a more nuanced picture of the experience and outlook of STEM graduates in the workforce. While the education and media narrative around STEM centers on the outsized influence of Big Tech and a belief that STEM training offers a sure path to career security, AEI's survey of STEM graduates provides the reader with fresh perspective on STEM through the eyes of STEM workers. For a majority of STEM graduates, a STEM career provides a path to a fulfilling and sustainable career. For others—particularly minorities, women, and those with less education—the reality is more complex, revealing a need for greater intentionality by employers, educators, and policymakers to promote a more holistic training agenda and a more inclusive STEM workplace environment.

STEM Perspectives

ATTITUDES, OPPORTUNITIES, AND BARRIERS IN AMERICA'S STEM WORKFORCE

Brent Orrell and Daniel A. Cox

STEM disciplines have long been regarded as the gold standard among majors and careers. From public policy to student career counseling, encouraging the acquisition of STEM credentials and degrees has been a cornerstone of US educational, employment, and economic strategy. As Figure 1 shows, this focus on STEM has paid off: Degrees conferred have grown steadily since the early 1990s, even as growth rates among other degrees have fluctuated or declined.

Some indicators seem to validate popular prioritization of STEM over other career paths. According to the US Bureau of Labor Statistics, STEM workers enjoy a median annual wage of $84,880, more than double the $37,020 annual wage earned by the median non-STEM worker.[4] The average non-STEM worker in the United States with a bachelor's degree earns around $1.7 million in their lifetime, while those who hold an undergraduate STEM degree can expect to earn an average of $2.2 million.[5] Further, a recent Pew Research Center report found that whether or not someone earns their paycheck from STEM, merely having a STEM degree is associated with higher earnings.[6]

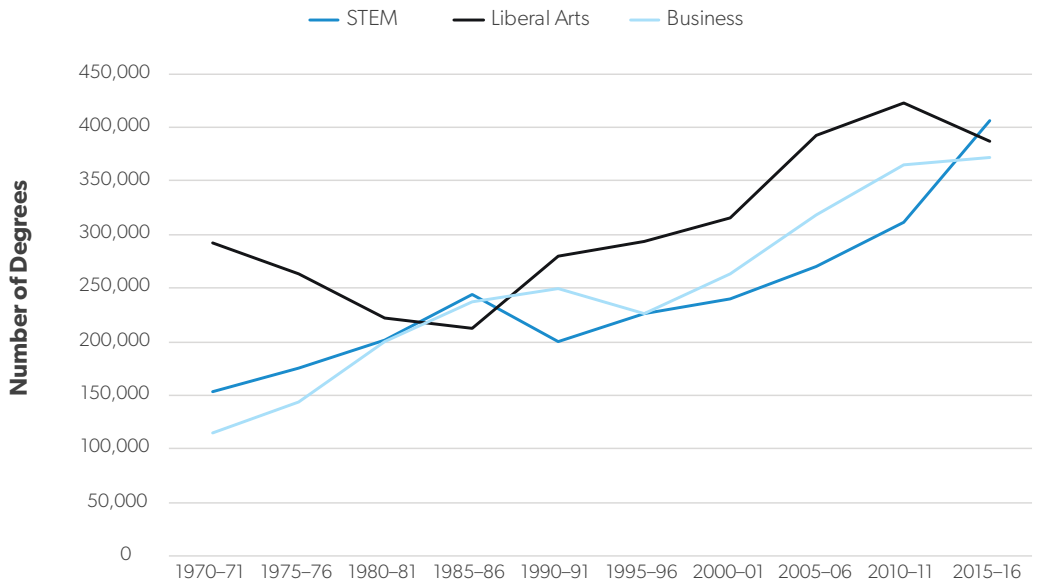
Labor market data suggest favorable employment prospects for STEM graduates. Currently, 9.7 million people are employed in STEM, and a 2017 Bureau of Labor Statistics analysis found that STEM employment grew by 10.5 percent from 2009 to 2015, more than doubling average growth in other occupations, albeit from a much lower base.[7] These trends are expected to continue, with STEM employment projected to grow by 8.8 percent from 2018 to 2028 (compared to 5 percent for non-STEM occupations).[8]

A closer look, however, reveals a more nuanced story, including unstable career footing for many STEM degree holders. A 2019 working paper by David Deming and Kadeem Noray at Harvard University found that almost 40 percent of applied STEM degree holders never enter a STEM occupation, and over 30 percent of those who do enter the STEM field leave by age 40.[9] Deming and Noray theorize that rapid rates of technological change are causing the skills STEM professionals developed in college to become increasingly obsolete, correlating to wage stagnation and reduced job security.

In fact, after about a decade in the field, STEM workers' earnings premium relative to other degree holders drops to nearly half of what it was when they began their careers.[10] According to Deming, "by age 40 the earnings of people who majored in fields like social science or history have caught up" to their STEM counterparts.[11] These trends, coupled with the well-documented susceptibility of routine tasks to automation and technological change, suggest a measure of concern for certain subsets of the STEM workforce.[12]

Nearly all future-of-work studies find that demand for complex technical knowledge will increase as

Figure 1. Degrees Conferred by Major



Source: Data from the author's analysis of National Center for Education Statistics data, 1970–2017.

automation requires more interactions between humans and machines. For example, the World Economic Forum's *Future of Jobs Report 2018* highlights significant increases in demand for data analysts, software developers, and artificial intelligence and machine learning specialists, among other tech-oriented jobs,[13] while a 2018 McKinsey Global Institute study found that employer demand for technological skills will increase by 55 percent —faster than all other skill categories—between now and 2030.[14]

Simultaneously, however, labor market data suggest that noncognitive or "implicit" skills—such as communication, the ability to work in teams, and creative thinking—are also growing in demand and value in the labor market as machines become more adept at performing routine tasks.[15] Employer surveys consistently show a prioritization of implicit skills over and above technical ones,[16] and labor market analyses have found significant growth in economic returns to these skills over the past three decades.[17]

STEM occupations in particular are seeing increased demand for implicit skills. A 2019 Burning Glass report analyzed millions of employer job postings to determine the prevalence of implicit skills such as problem-solving, critical thinking, communication, collaboration, and ethical reasoning. The researchers found that these skills were significantly more likely (39 percent) to be asked for in STEM-related job postings than they were in other occupations.[18] Further, a 2013 study of Google employee data found that seven of the eight most important skills to successful employees at the company were implicit in nature—such as communication, empathy, and problem-solving.[19] Traditional STEM expertise, it should be noted, was found to be the least important skill set among that list.

Deming's work and the research compiled by the industry on skill demands and imbalances, as well as instability in the STEM workforce raises the question of how workers in STEM-related industries perceive themselves, their education, and their career prospects: Do STEM workers feel the tension of a rapidly changing labor market? Do they worry about the impact of skills obsolescence, automation, and foreign competition? And, perhaps most importantly, why do so many people train in STEM fields and either never work in STEM industries or depart relatively early in their careers?

The Survey

In a new national survey of adults with an associate or more advanced STEM degree, we examine how people with a STEM educational background perceive the STEM career field, experiences they have had working in STEM, reflections on their STEM education, and their reasons for leaving the field. We adopt a definition of STEM degree fields based on the US Department of Homeland Security's "STEM Designated Degree Program List,"[20] in line with previous studies by Giovanni Peri, Kevin Shih, and Chad Sparber[21] and Deming and Noray.[22] STEM degrees include those in the fields of computer and information sciences, engineering, biological and life sciences, mathematics, physical sciences, and related fields.

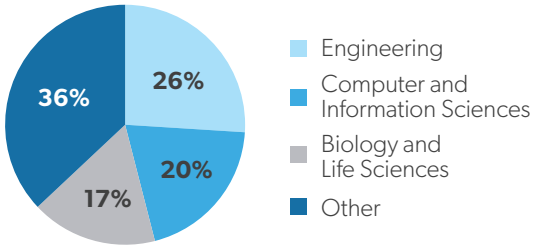
The survey used two screening questions to identify respondents with STEM degrees. The first question asked respondents whether they had a degree in a STEM field. Those who answered affirmatively were asked to continue with the survey. The second question asked respondents to identify the specific field of the degrees they had acquired. After completion of the survey, we reviewed respondents' self-reported degree fields to ensure only those with STEM degrees were included in the analysis.

Among the 1,368 adults with STEM degrees, engineering is the most common degree selected (26 percent), followed by computer and information sciences (20 percent) and biology and life sciences (17 percent).[23] (See Figure 2.) Fifteen percent have associate degrees, 50 percent have bachelor's degrees, and 36 percent have more advanced degrees.[24] (See Figure 3.)

About half (52 percent) of STEM degree holders surveyed say they currently work in a STEM occupation or field. An additional 35 percent are former STEM workers, including 10 percent who now work in a different field and 25 percent who are not employed in any field. Twelve percent of STEM degree holders have never worked in STEM, and of those, 8 percent currently work in another field.[25]

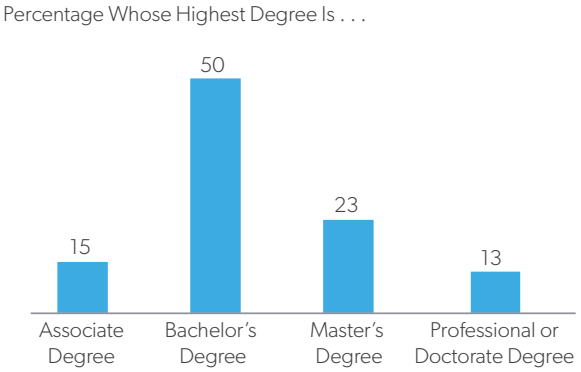
Sixty-five percent of STEM degree holders surveyed and more than seven in 10 of those currently working in STEM are men. Women represent

Figure 2. STEM Degree Fields of Survey Respondents



Note: Respondents' self-reported STEM degrees (open-ended responses) were coded into degree field categories. Further, some figures add to more than 100 percent due to rounding.
Source: AEI STEM Education and Workforce Survey, 2019.

Figure 3. Educational Attainment of Survey Respondents

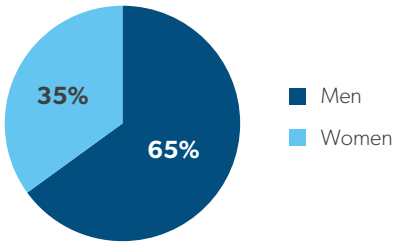


Note: Figures add to more than 100 percent due to rounding.
Source: AEI STEM Education and Workforce Survey, 2019.

35 percent and 29 percent of those groups, respectively (Figure 4). The gender balance is different among former STEM workers and those who have never worked in STEM, with men comprising smaller majorities than they do among current STEM workers (60 percent of former STEM workers and 58 percent of those who have never worked in STEM).

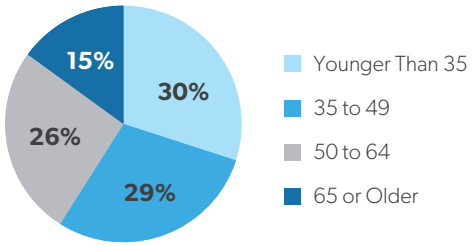
Thirty percent of STEM degree holders are younger than 35 years old, 29 percent are 35 to 49 years old, 26 percent are 50 to 64 years old, and 15 percent are age 65 or older (Figure 5). Seven in 10 (70 percent) identify as white; 14 percent as Asian, Hawaiian, or Pacific Islander; 9 percent as Hispanic;

Figure 4. Gender of Survey Respondents



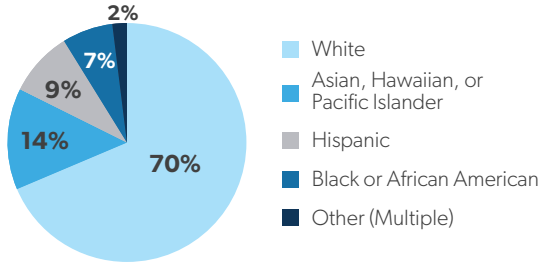
Source: AEI STEM Education and Workforce Survey, 2019.

Figure 5. Age of Survey Respondents



Source:AEI STEM Education and Workforce Survey, 2019.

Figure 6. Race or Ethnicity of Survey Respondents



Note: Figures add to more than 100 percent due to rounding.
Source: AEI STEM Education and Workforce Survey, 2019.

7 percent as black or African American; and 2 percent identify with other or multiple groups (Figure 6).

The median annual pretax salary range reported in the survey by STEM degree holders who are currently employed is $75,000 to $99,999, but reported income differs significantly between those who are currently working in a STEM field and those who are not. Forty-three percent of current STEM workers report earning $100,000 or more annually, compared to 22 percent of former STEM workers employed in a non-STEM field.

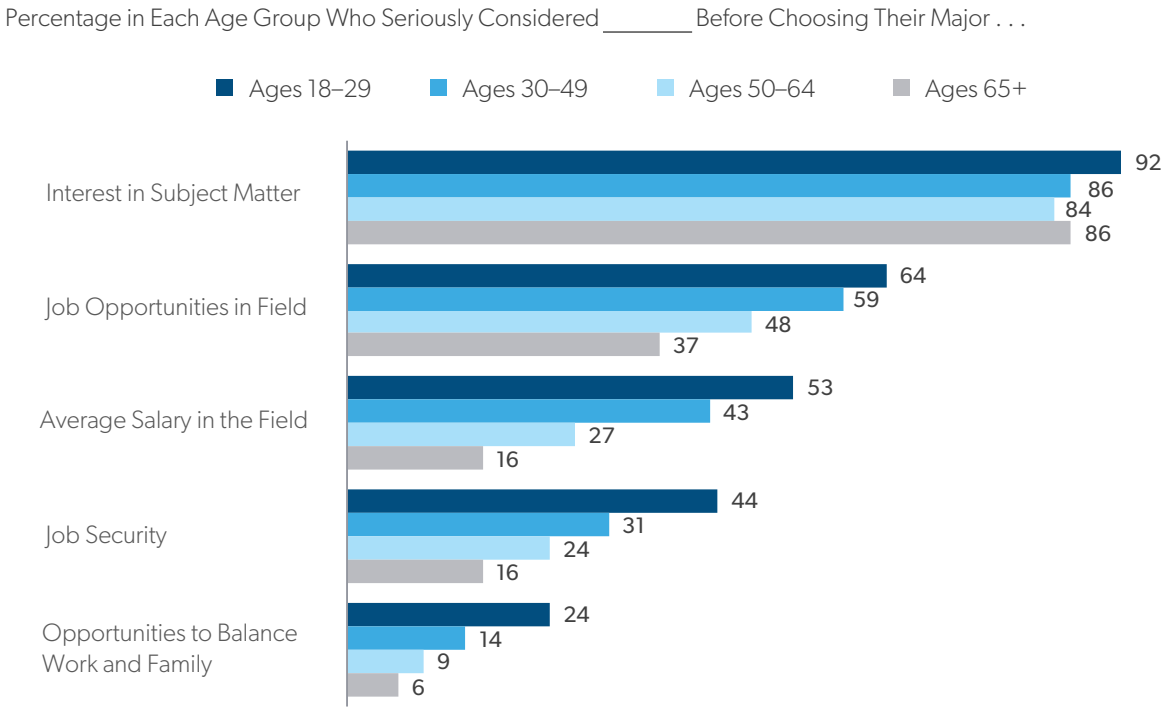
Educational Background and Workplace Preparation

In this section, we explore STEM graduates' backgrounds, examining factors such as family educational attainment and expectations, graduates' own educational experiences, and what factors helped them get their first job. We find that most STEM degree holders have at least one college-educated parent and that parental education levels and family expectations for attending college are positively correlated with STEM graduates' level of degree attainment. We also find that STEM degree holders are primarily drawn to STEM degrees out of interest in the subject matter, although young STEM workers are considerably more likely than older workers are to have considered job opportunities, job security, and average salary in the field as key factors in their decision-making process. While a majority of STEM degree holders across demographic groups seem content with their chosen college major, satisfaction varies by gender, current earnings, and level of degree attainment.

Family Background and Educational Attainment. Most STEM degree holders (59 percent) have at least one parent with a college degree, and nearly three-quarters (74 percent) grew up in families in which they were expected to go to a four-year college after high school.

Younger people with STEM degrees are more likely than older STEM degree holders are to have parents who graduated from college. Seventy-five percent of STEM degree holders under age 35 have at least one college graduate parent, compared to 63 percent of 35- to 49-year-olds, 50 percent of 50- to 64-year-olds, and 38 percent of those age 65 or older. Family expectations also vary by age group but not as dramatically: 79 percent of those

Figure 7. Factors in Choosing a STEM Major, by Age



Note: Figures add to more than 100 percent because multiple responses were allowed.
Source: AEI STEM Education and Workforce Survey, 2019.

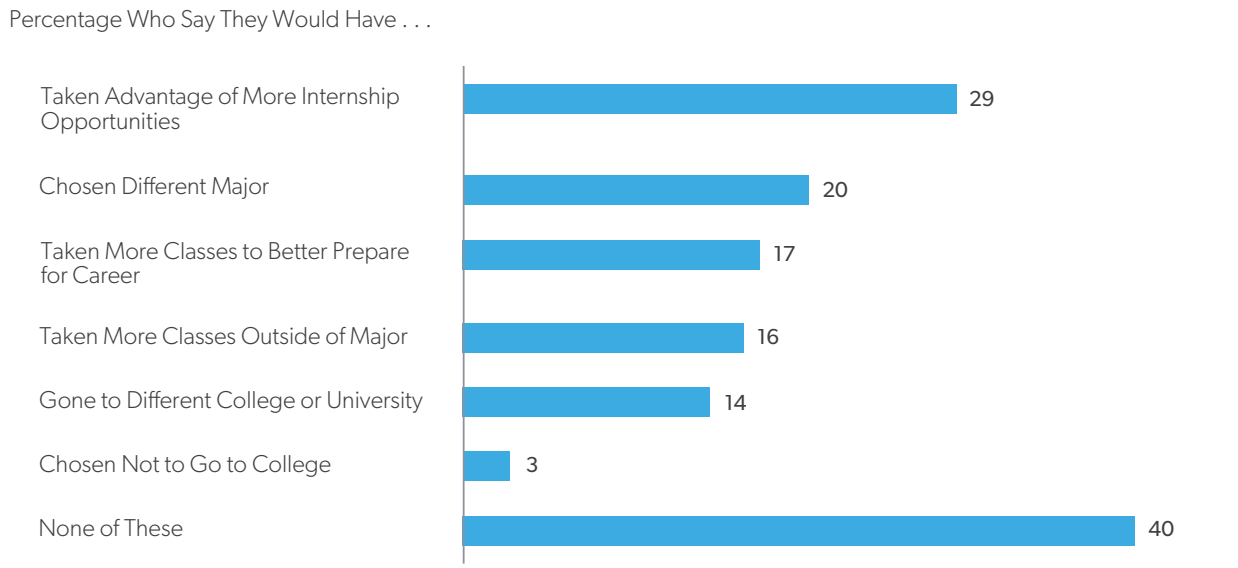
younger than 35 years old and 76 percent of those age 35 to 49 report being expected to get a four-year degree, compared to 67 percent of those age 65 or older.

Parental education level and family expectations vary somewhat among STEM degree holders of different racial backgrounds. Thirty-five percent of white and Asian, Hawaiian, or Pacific Islander STEM degree holders have two degreeholding parents, compared to 25 percent of those in other racial groups (African American, Hispanic, and other groups combined). No racial or ethnic group reports more consistent expectations for college than Asian American, Hawaiian, or Pacific Islander STEM degree holders; 83 percent say that growing up, they were expected to go to a four-year college.

Family background and expectations both appear to play a significant role in STEM degree holders' educational attainment. Sixty-one percent of those with associate degrees say neither of their parents had a college degree, and less than a third (31 percent) say their family expected them to attend a four-year college. In contrast, the majority of those with bachelor's degrees or more advanced degrees say one or both of their parents graduated from college, and more than eight in 10 (82 percent) say their families expected them to attend a four-year college.

Choosing a Major. STEM degree holders appear to be primarily driven by subject matter interest when deciding on their field. (See Figure 7.) Eighty-six percent of STEM degree holders cited interest in the field as a factor they seriously considered when choosing their major, followed by job opportunities in the STEM field (54 percent). Financial considerations appear to be less relevant. About only one-third (36 percent) say the average salary in the field was an important consideration, while only 29 percent cited job security. Opportunities to balance work and family did not seem to matter much to STEM degree

Figure 8. What STEM Degree Holders Wish They Had Done in College to Help Them Succeed in Today's Labor Market



Note: Figures add to more than 100 percent because multiple responses were allowed unless a respondent selected "none of these." The question's wording was: "Thinking back to when you were in college, is there anything you would have done differently to help you succeed in today's labor market or workplace? Select all that apply."
Source: AEI STEM Education and Workforce Survey, 2019.

holders, with only 13 percent reporting that it was a major consideration for them.

Job opportunities are more commonly cited as a factor by people who have recently earned STEM degrees than they are by the previous generation of STEM graduates. More than six in 10 (64 percent) young STEM-educated Americans (age 18 to 29) say job opportunities in the field were an important consideration in their decision to major in STEM. In contrast, only 37 percent of Americans age 65 or older with a STEM background say career prospects were why they majored in STEM. Younger STEM degree holders are also more likely than are those age 65 or older to say the average salary in the field was an important consideration (53 percent versus 16 percent).

Decision Factors Differ by Gender. STEM degree-holding men are slightly more likely than STEM degree-holding women are to say they seriously considered job opportunities (56 percent versus 50 percent) and average salary (40 percent versus 30 percent) in the field when selecting their major. More women than men say they considered opportunities to balance work and family (18 percent versus 11 percent).

Reflections on the Education Experience. Overall, STEM degree holders seem largely content with their degree choice. As Figure 8 shows, only 20 percent think choosing a different major would have allowed them to have better success in the labor market, and only 16 percent regret not taking more classes outside their major. The most common regret expressed by STEM degree holders is that they did not take advantage of more internship opportunities. Twenty-nine percent of Americans with a STEM background say they should have taken more advantage of internships, and 17 percent say they would have taken more classes to better prepare for a career. Few STEM degree holders regret their choice of school (14 percent would have chosen differently), and only 3 percent say they would have chosen not to go to college.

Regrets about educational choices vary by income group. Twenty-four percent of STEM graduates earning less than $50,000 say they would have chosen a different major, compared to only 14 percent of those making $150,000 or more. Twenty-eight percent of those making less than $50,000 wish they had taken more classes to better prepare for a career, and 37 percent say they would have participated in more internships. Among STEM graduates making $150,000 or more, 11 percent and 25 percent expressed those regrets, respectively.

Almost twice as many associate degree holders (23 percent) as those with bachelor's degrees or higher (12 percent) say they would have attended a different college or university. People with doctorate or professional STEM degrees express relatively little regret overall, with 53 percent saying they would not have done anything differently.

Female STEM graduates express more regret about their academic decisions than male graduates do. More than one-quarter (26 percent) of female STEM degree holders regret their choice of major, compared to 17 percent of men.

Overall, younger STEM degree holders are more likely than older STEM degree holders are to say they have regrets about their academic decisions. Forty-three percent of STEM graduates under age 35 say they should have taken advantage of more internship opportunities, compared to 26 percent of those age 35 to 49, 25 percent of those age 50 to 64, and 11 percent of those age 65 or older. Twenty-four percent of those under age 35 say they wish they had taken more classes to better prepare for a career, compared to 18 percent of 35- to 49-year-olds, 13 percent of 50- to 64-year-olds, and 12 percent of those age 65 or older.

Current STEM workers express fewer regrets overall about their college experience than former STEM workers who are now employed in a non-STEM field do. The biggest difference is in how they reflect on their choice of major: Only 17 percent of those currently working in STEM say they would have chosen a different major, compared to 34 percent of former STEM workers currently working in another field and 25 percent of STEM degree holders never employed in STEM. Still, a strong majority of all groups (83 percent, 66 percent, and 75 percent, respectively) would have pursued the same major.

Getting the First Job. STEM graduates consider the skills and training acquired as part of their college education to be the most important factor in getting their first job out of college (32 percent), followed by internship or workplace experience (23 percent).[26] Notably, graduates see the reputation of their college as relatively unimportant, with only 6 percent citing it as the leading factor in securing their first job post-college. Further, only 17 percent of STEM graduates list grades, coursework, or academic experience as the most important factor in landing their first job. A higher share of those with professional or doctorate degrees (26 percent) named that as most important.

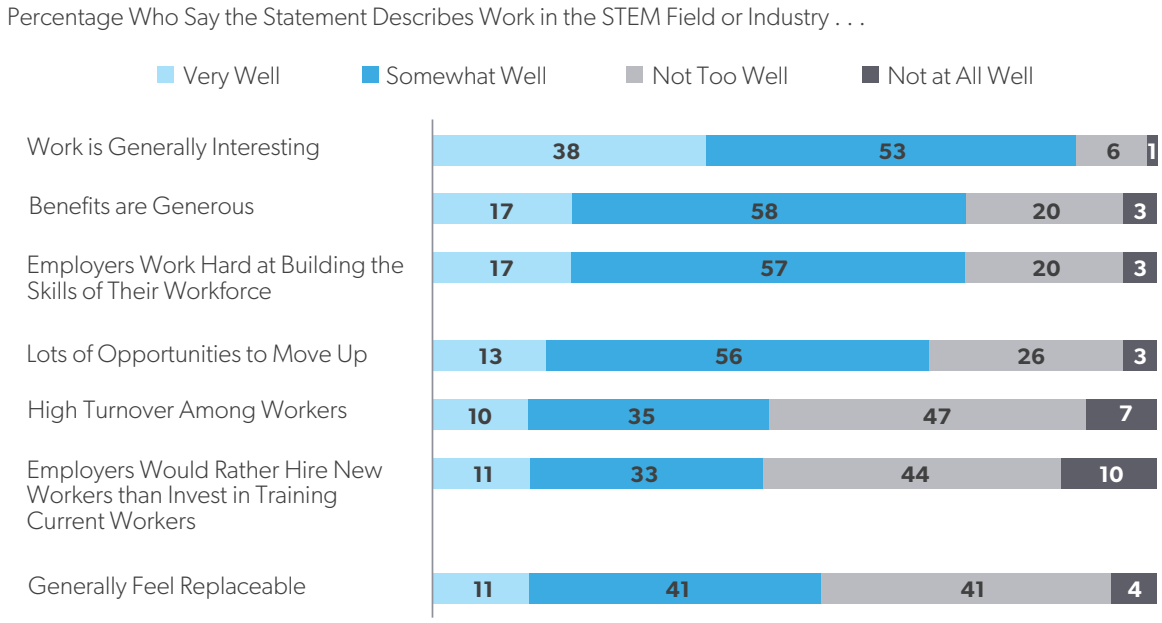
Perceptions of the STEM Industry

In this section, we examine perceptions of the STEM industry and how it compares to other fields. We begin by observing how STEM graduates feel about a myriad of factors in STEM including earnings potential, opportunities for advancement, collegiality and employer support, and how interesting and meaningful the work is. We also look at how people perceive potential barriers faced by women, minority groups, older workers, and others in the STEM field relative to other career fields.

Overall, we find that STEM degree holders express positive views toward many aspects of the STEM industry (including in compensation and respect), although substantial shares think that STEM workers feel replaceable and that worker turnover is high in the field. Certain workers are perceived as facing more challenges than other groups, particularly older workers, female workers, African American workers, and Hispanic workers.

The Benefits and Challenges of STEM Work: Generous Compensation and High Turnover. Americans with STEM degrees offer generally positive views of the industry, although some express

Figure 9. Perceptions of the STEM Career Field



Source: AEI STEM Education and Workforce Survey, 2019.

concerns about the extent to which workers feel valued by their employers.

As Figure 9 shows, there is near-universal agreement among STEM degree holders that work in the field is generally interesting, with about nine in 10 (91 percent) STEM degree holders saying that describes the field very or somewhat well. Three-quarters (75 percent) of STEM degree holders say that having generous benefits describes the experience of working in the field at least somewhat well.

Nearly seven in 10 STEM degree holders (69 percent) believe that having many opportunities to move up characterizes work in the field well. Notably, STEM degree holders generally embrace this view across race and ethnicity, age, gender, and education level.

Most STEM degree holders think STEM employers work hard to develop their workforce's skills, with 74 percent saying that describes the industry very or somewhat well. Their perceptions are somewhat less positive on other questions about the extent to which workers in STEM feel valued and secure in their field. Meanwhile, more than half (52 percent) of STEM degree holders say the statement "people generally feel like they are replaceable" describes the field very or somewhat well.

STEM degree holders with professional or doctorate degrees are less likely than those with less advanced degrees are to say STEM workers generally feel replaceable. Thirty-seven percent of those with professional or doctorate degrees say that describes work in the STEM field well, compared to 53 percent of those with master's degrees and 55 percent of those with bachelor's or associate degrees. Responses also differ by age, with 48 percent of STEM-educated Americans under 35 years old, compared to 60 percent of those nearing retirement age (age 50 to 64), viewing the STEM field as one in which people generally feel replaceable.

There is some disagreement among STEM degree holders about whether employers would prefer bringing on new talent rather than training their current workforce. About four in 10 (44 percent) STEM degree holders express that employers in STEM would rather hire new workers than invest in training

their current workers, while 54 percent say that does not describe the industry well. A larger share of STEM degree holders age 50 to 64 (50 percent) than those under age 35 (39 percent) think the industry is fairly characterized as one in which employers would rather hire new workers than invest in training their current employees.

Nonwhite STEM degree holders offer more negative assessments of STEM employers than white STEM degree holders do. More than half (52 percent) of nonwhite STEM degree holders believe employers would prefer to bring on new talent as opposed to training their current workforce. Fewer (40 percent) white STEM degree holders agree.

Perceptions of turnover in the field are mixed. Forty-five percent of STEM degree holders believe there is high turnover among workers in STEM, while over half (54 percent) say that does not describe the industry well. There are no significant differences in perspectives among STEM degree holders by race and ethnicity, age, or gender.

Americans with STEM degrees who work in STEM generally perceive the STEM career field more positively than do those who have left the field and work in other occupations. More than seven in 10 current STEM workers feel that benefits are generous (78 percent), think employers work hard at building their employees' skills (78 percent), and believe there are many opportunities to move up (73 percent). Among former STEM workers employed in non-STEM occupations, 64 percent, 68 percent, and 61 percent respectively say those statements describe the work in the STEM field well.

Current STEM workers are less likely than former STEM workers who are employed in another industry to think people generally feel like they are replaceable in STEM. (Fifty percent versus 63 percent say that describes the field well.) Current STEM workers are also less likely than former STEM workers employed in non-STEM fields to say that employers in STEM would rather hire new workers than invest in training (42 versus 56 percent) and that there is high turnover among workers in STEM (44 percent versus 57 percent).

Large majorities of current and former STEM workers employed in other fields agree that work in the STEM field is generally interesting. Ninety-three percent of current STEM workers say that describes the STEM field well, and 89 percent of employed workers who formerly worked in STEM say the same.

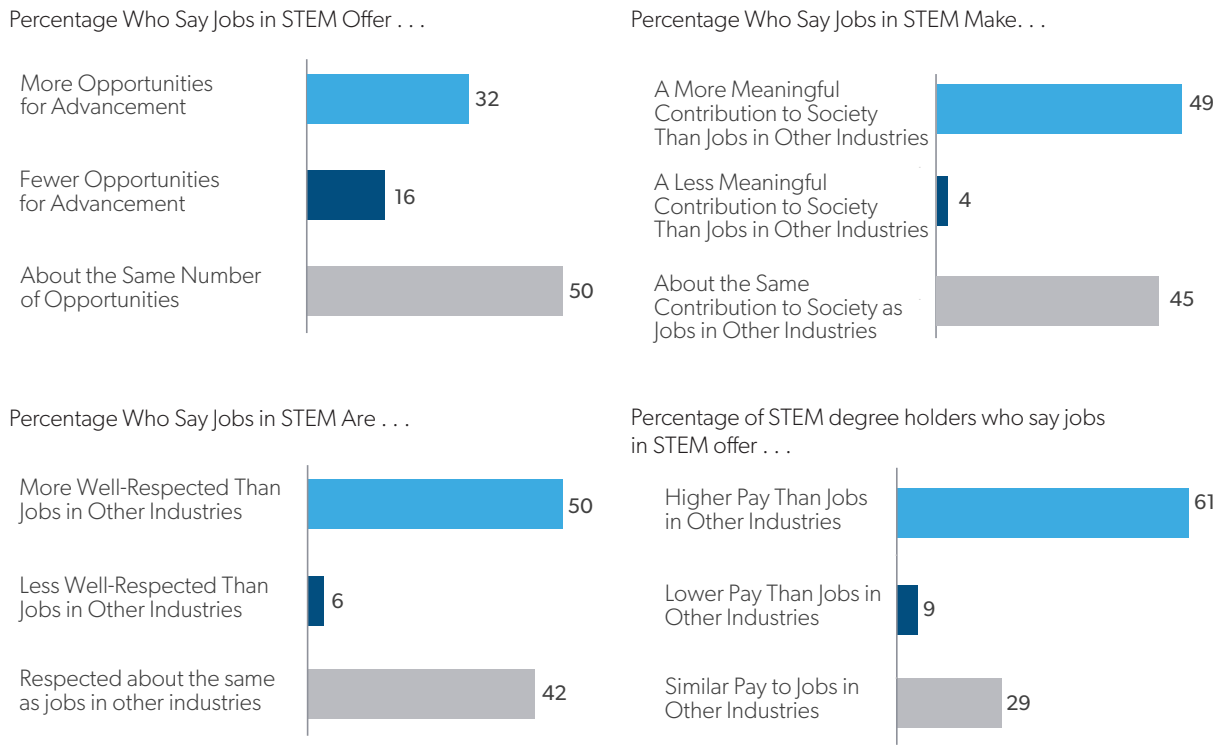
How STEM Jobs Compare to Other Fields. Americans with STEM backgrounds generally view the industry's career benefits positively. Most believe that STEM careers provide better compensation than careers in other industries do, and many STEM-educated Americans believe careers in STEM are more respected and make more meaningful contributions to society than other career options do. However, fewer STEM-educated Americans believe that a career in STEM provides better opportunities for advancement than other career paths do.

Earning Potential. When choosing a field of study, Americans with STEM degrees often consider the economic payoff of their educational investment. As Figure 10 shows, more than six in 10 (61 percent) Americans with a STEM background say a STEM career offers higher wages than other industries do. Twenty-nine percent say wages are comparable, while 9 percent say wages are lower than other professions. Men and women with STEM degrees have similar perceptions of the earning benefits of STEM jobs. (Sixty-two percent of men and 58 percent of women say they offer higher pay.)

Higher-earning, STEM-educated Americans are more inclined to say STEM careers offer comparative advantages in compensation. Fifty-three percent of STEM-educated Americans earning less than $50,000 a year believe STEM careers offer a competitive earning advantage over non-STEM careers, compared to 73 percent of STEM-educated Americans earning at least $150,000 a year.

STEM degree holders working in STEM assess income potential more positively than do former STEM workers now employed in non-STEM fields. Sixty-three percent of current STEM workers say jobs in STEM offer higher pay than jobs in other industries

Figure 10. Comparing STEM to Other Industries



Source: AEI STEM Education and Workforce Survey, 2019.

do, compared to 53 percent of those who have left the field and work in other occupations. Responses also differ by income level among those working in the STEM field. Fifty-seven percent of current STEM workers who earn less than $100,000 per year say jobs in STEM offer higher pay than other industries do, compared to 75 percent of those earning $100,000 or more per year.

Professional Respect and Contribution to Society. Half of Americans with a STEM degree say STEM professions garner greater respect than jobs in other industries do. Forty-two percent say STEM jobs are about as respected as other career fields, while only 6 percent say they are less respected.

STEM degree holders offer similar assessments of the STEM field's contribution to society. Nearly half (49 percent) of all Americans with a STEM educational background think careers in STEM make a more meaningful contribution to society than other career options do. Forty-five percent say jobs in STEM make about the same contribution as jobs in other industries do, while only 4 percent say STEM jobs make a less meaningful contribution.

Perceptions of how much people respect the field do not differ significantly by education level, but STEM-educated Americans with professional or doctorate degrees are somewhat more likely than those with lower-level degrees are to say STEM jobs make a more meaningful contribution to society than jobs in other industries do. Fifty-eight percent of those with professional or doctorate degrees give that response, compared to 49 percent of master's degree holders and 48 percent of associate and bachelor's degree holders. STEM degree holders currently employed in STEM and those working in other industries express similar opinions on how STEM jobs compare to non-STEM jobs in their relative prestige and contribution to society.

Advancement Opportunities. Despite the perceived earnings advantage, fewer Americans with STEM degrees believe STEM careers offer greater opportunities for advancement than do other career paths (32 percent). Half say jobs in STEM offer about the same number of opportunities as those in other industries do, and 16 percent say STEM offers fewer opportunities. STEM degree holders with different levels of education share similar perceptions of opportunity in the field compared to other fields.

Current STEM workers are somewhat more positive about opportunities in the field than are those who have left and work in a non-STEM field, although about half of each group say opportunities to advance are similar to other fields (50 percent and 52 percent, respectively). Thirty-six percent of current STEM workers say jobs in STEM offer more opportunities for advancement, and 13 percent say they offer fewer opportunities. Among former STEM workers employed in a different field, responses are about evenly split between positive and negative, with 25 percent saying STEM jobs offer more opportunities and 23 percent saying they offer fewer opportunities than jobs in other industries do.

Obstacles in the Workplace: Gender, Race and Ethnicity, Age, Parental Status, and Political Ideology. Among STEM degree holders, age is seen as the most significant impediment to getting ahead in the field. Compared to work in other fields, STEM degree holders say being older (over age 50) is more of a liability in STEM than is being a woman, person of color, a parent, or politically conservative. Close to half of STEM degree holders say people over age 50 face more obstacles in STEM than they do in other fields. A significant number of STEM degree holders also say women, black Americans, Hispanic Americans, and parents of young children face more obstacles in STEM than they do in other fields. There are demographic differences in views of the challenges various groups face.

Gender. Forty-one percent of STEM degree holders think women face more challenges in STEM than they do in other fields, but about as many (45 percent) say they face about the same number of obstacles, and 12 percent say they face fewer.

As Figure 11 shows, there are profound differences between male and female STEM degree holders. About one-third (34 percent) of men but a majority (54 percent) of women with STEM educational backgrounds say women face greater obstacles in STEM than they do in other fields. Forty-eight percent of men with STEM degrees say women experience the same degree of challenges in STEM as they do in other fields, and 15 percent say women face fewer obstacles.

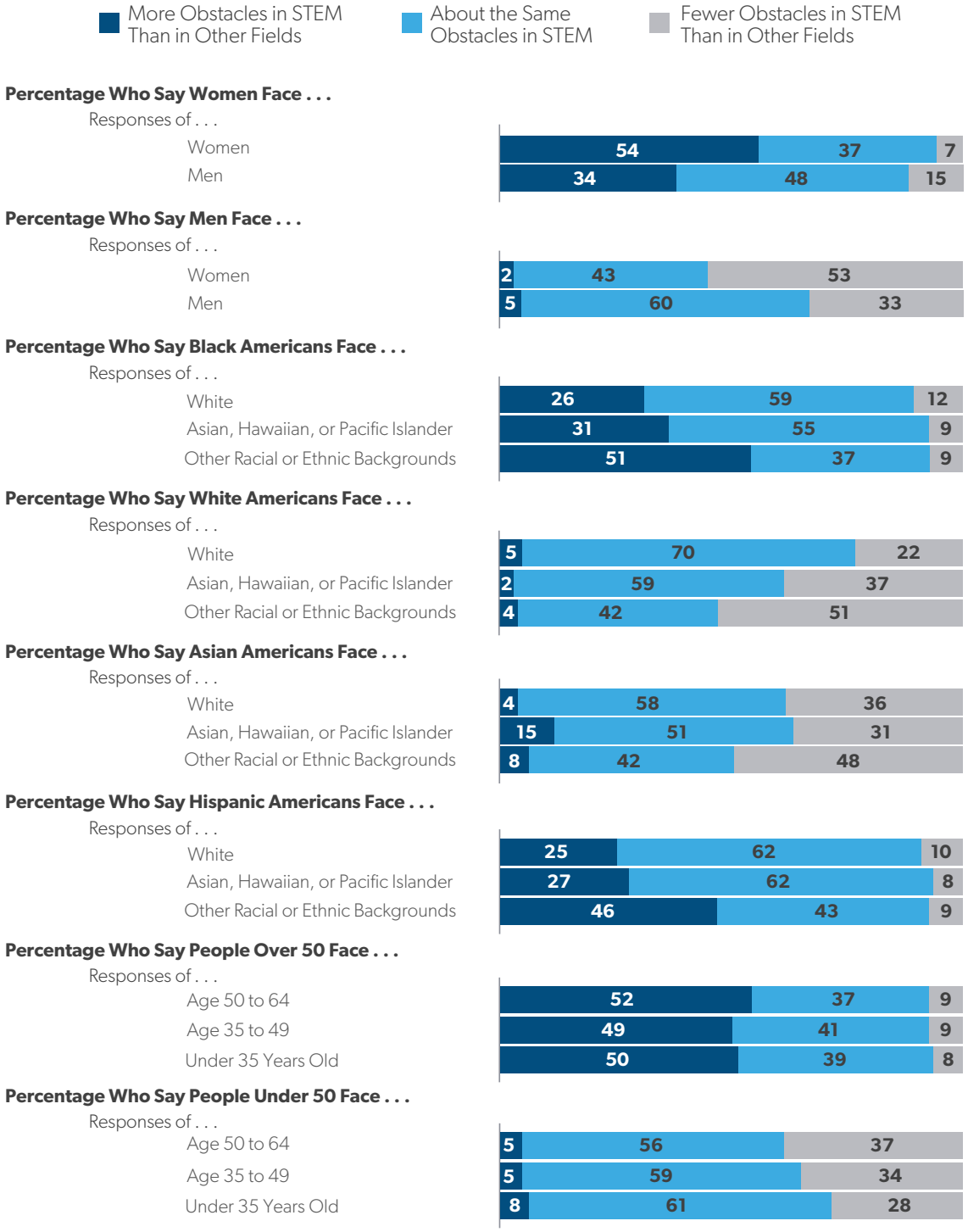
Men and women with STEM degrees also differ over the extent to which male STEM workers are advantaged based on their gender. Female STEM degree holders are more likely than male STEM degree holders are to say that men face fewer obstacles in STEM than they do in other fields (53 percent versus 33 percent, respectively). A majority (60 percent) of men with STEM degrees say men face about the same number of obstacles to getting ahead in STEM. Few male and female STEM degree holders believe men in STEM face greater obstacles in the field than they do in other fields (5 percent and 2 percent, respectively).

Race and Ethnicity. Most people with STEM degrees do not believe workers of color face more obstacles in STEM than they do in other fields. However, higher percentages of STEM degree holders say black and Hispanic Americans face more obstacles to getting ahead in STEM than say white or Asian Americans do. Thirty-one percent of STEM degree holders say black Americans face more obstacles in the STEM field than they do in other industries, and 29 percent say Hispanic Americans do.

In contrast, only 6 percent say Asian Americans face more hurdles in STEM than they do elsewhere. Similarly, only 5 percent say white Americans face more obstacles in STEM than they do in other fields. Notably, more STEM degree holders say Asian Americans face fewer obstacles in STEM than say white Americans do (37 percent versus 29 percent).

There are sharp racial divisions among STEM degree holders in perceptions over the degree to which certain groups are advantaged or disadvantaged

Figure 11. Perceptions of Gender and Obstacles to Advancement in STEM vs. Other Fields



Note: The question's wording was: "Compared to other fields and industries, do you think the following groups of people face more obstacles to getting ahead in STEM fields, about the same number of obstacles to getting ahead in STEM fields, or fewer obstacles to getting ahead in STEM fields?" Other racial or ethnic backgrounds include black, non-Hispanic; Native American or Alaska Native, non-Hispanic; Hispanic; and multi-race, non-Hispanic.
Source: AEI STEM Education and Workforce Survey, 2019.

in STEM. White and Asian, Hawaiian, or Pacific Islander STEM degree holders are less likely than those of other racial or ethnic backgrounds are to say black and Hispanic Americans face more obstacles in STEM than they do in other fields.[27] Twenty-six percent of white and 31 percent of Asian, Hawaiian, or Pacific Islander STEM degree holders say black Americans face more obstacles in STEM than they do in other fields, compared to 51 percent of STEM degree holders of other racial or ethnic backgrounds. When asked about Hispanic Americans, 25 percent, 27 percent, and 46 percent of those respective groups say Hispanics face more obstacles in STEM.

Fewer white STEM degree holders than non-white STEM degree holders see white Americans as advantaged in the STEM field. Twenty-two percent of whites, compared to 37 percent of Asians, Hawaiians, or Pacific Islanders and 51 percent of those in other racial and ethnic groups, say white STEM workers face fewer obstacles than white workers in other industries face.

When asked about the obstacles Asian Americans face in STEM relative to other fields, 31 percent of Asian, Hawaiian, or Pacific Islander STEM degree holders say Asian Americans face fewer obstacles, 51 percent say they face about the same number, and 15 percent say they face more obstacles. Among white STEM degree holders, 36 percent, 58 percent, and 4 percent give those responses, respectively. STEM degree holders of other racial and ethnic backgrounds are somewhat more likely to see Asian Americans as advantaged; 48 percent think they have to overcome fewer hurdles, 42 percent think about the same number, and 8 percent think they face more.

Age. Americans with STEM degrees are more inclined to believe that advancing age is a greater liability in STEM than are gender or race and ethnicity: Nearly half (49 percent) say older Americans (over age 50) face more obstacles in STEM than they do in other industries. Forty percent say older Americans face the same amount of challenges, and only 8 percent say they experience fewer. There is general agreement among STEM degree holders across the age spectrum. About half of those under 35 years old (50 percent), 35 to 49 years old (49 percent), and 50 to 64 years old (52 percent) believe that older workers face more obstacles in STEM than they do elsewhere.

STEM degree holders appear somewhat less convinced that younger people have an easier time getting ahead in STEM fields. About one-third (32 percent) say that people under age 50 face fewer obstacles in STEM than they do in other fields, while six in 10 (60 percent) say they face about the same degree of difficulty in STEM, and 6 percent say they face more challenges. STEM degree holders nearing retirement age tend to see more of a youth advantage. Thirty-seven percent of 50- to 64-year-olds say people under age 50 face fewer obstacles in STEM than they do in other industries, compared to 28 percent of those under age 35.

Parental Status. Few STEM degree holders believe that being a parent is more difficult in their industry than it is in other industries. Only 27 percent of parents with young children believe they face more obstacles to advancement or success in STEM. Roughly two-thirds (64 percent) believe parents face about as many challenges in STEM as they would in another profession. Six percent think parents with young children have an easier time getting ahead in STEM fields.

Overall, Americans with STEM degrees who have children under age 18 in their households do not differ significantly in their views from STEM degree holders who live in households without any children. However, there are somewhat larger gender differences among those with children than among those without. Women who live in households with children under age 18 are almost twice as likely as men (41 percent versus 22 percent) to say parents face more obstacles in STEM than they do in other industries. Among those in childless households, 34 percent of female STEM degree holders and 23 percent of male STEM degree holders express that view.

Political Ideology. Few Americans with STEM degrees believe that political conservatives experience greater difficulty in STEM than they do elsewhere. Only 11 percent believe conservatives have more obstacles to overcome compared to other professions. Nearly eight in

10 (77 percent) STEM degree holders say political conservatives face the same challenges in STEM as they do in other fields, and 9 percent say they experience less.

STEM degree holders also largely reject the idea that political liberals have an easier time in STEM. Only 14 percent say liberals face fewer obstacles in STEM than they do elsewhere. The vast majority (78 percent) believe liberals experience the same challenges in the STEM field as they do in other fields. Five percent say they experience more. Liberal and conservative STEM degree holders do not differ significantly in their views, with large majorities saying ideology does not create hurdles or provide advantages for workers in the STEM industry.

Experiences Working in STEM

In this section, we turn from general perceptions of the STEM field to examine the personal experiences of STEM degree holders working in STEM occupations. Understanding how STEM workers feel about various aspects of their careers can provide insights into what characteristics—of either workers or their work environment—are associated with greater vocational satisfaction. This, in turn, may help inform investigations into why some workers stay in STEM, while others leave the field.

We begin by examining who is currently working in STEM and how they feel about their current field, including levels of job satisfaction, fear of automation and foreign competition, the importance of interpersonal versus technical skills, and whether they have ever considered leaving the field. We also look at questions related to workplace environment (collegiality, teamwork, etc.) and to what extent STEM workers feel pressure to learn new skills consistently.

We find that a majority of STEM workers are content with their workplace environment, although responses vary based on size of firm and the demographic makeup of the workforce. Some differences can be seen by age and gender, as older workers are more likely than younger workers are to express concern over automation and emphasize the importance of implicit or interpersonal skills in their work, while women are more likely than men are to value interpersonal skills as "extremely important" and derive a sense of identity from their work. Further, a majority of STEM workers feel pressure to learn new skills as they progress through their career, but most say their employers offer resources to help with the upskilling process.

The Demographics of STEM Offices. Consistent with previous research showing the STEM industry skews white and male, most STEM workers report primarily working with people who are white or male.[28] Roughly six in 10 (59 percent) current STEM workers say that all or most of the colleagues they regularly interact with are white. About one-quarter (26 percent) say roughly half their colleagues are white, and only 14 percent say less than half the people at their workplace are white.

More than half (52 percent) of STEM workers say the people they regularly interact with are mostly or all men. Twenty-nine percent say about half their coworkers are men, and only 18 percent say less than half, very few, or none are men.

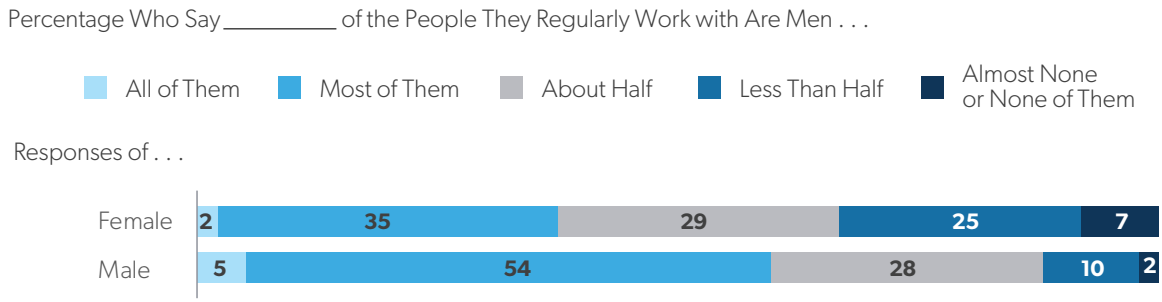
As Figure 12 shows, the experiences of male and female STEM workers differ dramatically. Nearly six in 10 (59 percent) male STEM workers say all or most of the people they work with are male. In contrast, only 37 percent of female workers say the same.

As Figure 13 shows, the experiences of white and nonwhite STEM workers also vary. Nearly two-thirds (65 percent) of white STEM workers say the people they regularly interact with in the workplace are mostly or all white, while less than half (48 percent) of nonwhite STEM workers say the same.

Team-Based vs. Solo Work. Although STEM work is often portrayed as a solitary experience, most STEM workers generally report a high level of team-based work. About two-thirds (65 percent) of STEM workers say they mostly work as part of a team, while 34 percent say they mostly work on their own.

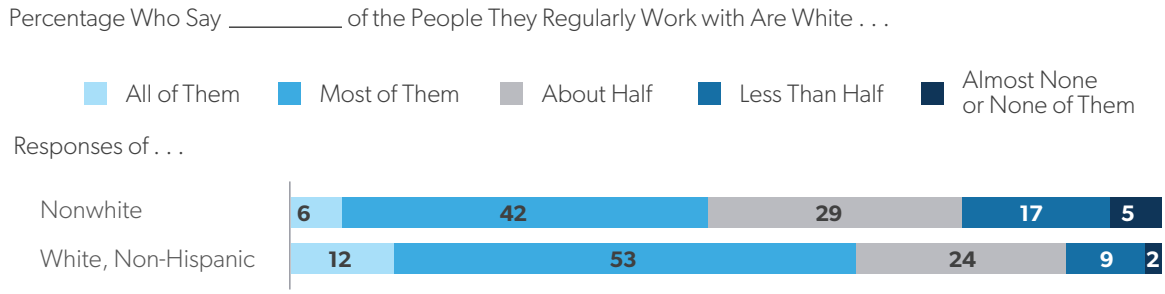
There are notable differences in experiences of STEM workers based on the size of their company. STEM workers who are employed by smaller companies (fewer than 100 employees) report more

Figure 12. Workplace Demographics: Share of Male Colleagues



Note: Based on responses of those who currently work in STEM. The question's wording was: "About how many of the people you regularly work with are . . . men?"
Source: AEI STEM Education and Workforce Survey, 2019.

Figure 13. Workplace Demographics: Share of White Colleagues



Note: Based on responses of those who currently work in STEM. The question's wording was: "About how many of the people you regularly work with are . . . white?"
Source: AEI STEM Education and Workforce Survey, 2019.

solitary work than do those in companies with more than 2,000 employees (40 percent versus 27 percent).

Coworkers of STEM employees. Most STEM workers report they primarily work with other people with STEM backgrounds. Sixty-one percent report they mostly work with other STEM employees, 16 percent say mostly non-STEM, and 21 percent say they work equally with STEM and non-STEM coworkers.

STEM workers who have smaller employers (fewer than 100 employees) are less likely to work with other people who have STEM backgrounds than are those in large companies (at least 2,000 employees). About half (53 percent) of STEM workers at small companies say they primarily work with other STEM workers, while 70 percent of those at large companies say the same.

Further, the more STEM workers make, the more likely they are to work with others with a STEM background. Among workers making less than $75,000 per year, 57 percent work mostly with other STEM workers. This figure rises to 66 percent among those earning over $150,000 per year.

Personal Job Satisfaction. Overall, STEM workers feel satisfied with the various aspects of their work, including job security, workplace stress, salary, recognition, and opportunities for advancement.

More than eight in 10 STEM workers say they feel completely (44 percent) or somewhat (42 percent) satisfied with their job security. More than three-quarters (78 percent) of STEM workers say

they feel satisfied with the amount of work expected of them, including 31 percent who feel completely satisfied. A similar number (77 percent) of STEM workers report they are satisfied with the amount of money they earn, with 29 percent reporting they are completely satisfied.

Roughly three-quarters of STEM workers say they feel completely (25 percent) or somewhat satisfied (49 percent) by the recognition they receive at work. More than two-thirds (68 percent) of STEM workers express satisfaction with the amount of on-the-job stress they experience as part of their work. Sixty-four percent of workers say they feel satisfied with their chances for promotion.

Satisfaction with earnings varies by income level. Looking at four income groups, the only group in which more than half (54 percent) say they are completely satisfied with their earnings are those making $150,000 or more.

Still, majorities of STEM workers at all income levels say they are at least somewhat satisfied, including 91 percent of those making $150,000 or more, 86 percent of those making $100,000 to $149,999, and 80 percent of those making $75,000 to $99,999. STEM workers making less than $75,000 express the lowest satisfaction, with 59 percent saying they are completely (13 percent) or somewhat (46 percent) satisfied. Workers earning $150,000 or more also express somewhat greater satisfaction with their chances for promotion (74 percent) than do those with annual salaries lower than $150,000 (60 to 64 percent of other income groups). On other measures, STEM workers in the highest and lowest income groups express comparable satisfaction with their employment situation.

White and nonwhite STEM workers express similar levels of satisfaction across most of these areas, with one important exception. White STEM workers report greater feelings of satisfaction about their opportunities for advancement than nonwhite workers do (68 percent versus 60 percent, respectively).

There are also few differences between male and female STEM workers in terms of satisfaction with most aspects of their jobs. However, male STEM workers express greater feelings of satisfaction than female workers do about their level of compensation (81 percent versus 70 percent).

While general satisfaction does not differ by workplace size, STEM workers who work for larger employers report a higher degree of satisfaction on some measures than those who work for small companies do. STEM workers who report working at companies with at least 2,000 employees at their work location are more likely to report feeling completely satisfied with their job security than do those who work at companies with fewer than 100 employees (54 percent versus 37 percent). Employees at larger companies are also more likely to report feeling completely satisfied with their earnings (38 percent versus 25 percent).

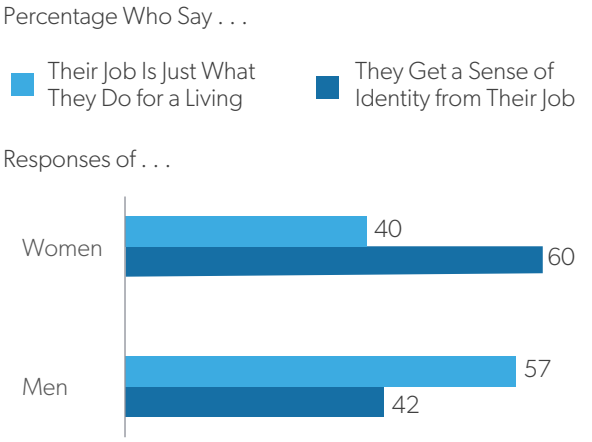
Salary Expectations. Few STEM workers believe they are making more money at this point in their career than they expected. Only 22 percent say they are making more money than they thought they would, while 34 percent say they are making less. Almost half (44 percent) of those currently employed in STEM report they are making about what they expected.

Perhaps unsurprisingly, it appears an inverse relationship exists across income groups and how they feel about their annual pay. Only 12 percent of workers making less than $75,000 annually say they are making more money than they expected. A majority (54 percent) say they are making less, while about one-third (34 percent) say they are earning about what they expected at this stage in their career. Conversely, about one-third (34 percent) of workers with annual incomes over $150,000 per year say they are making more than they expected, while only 11 percent say they are earning less. A majority (55 percent) of high-income workers say they are making about what they expected.

There are also differences in the perspectives of workers by race and ethnicity. Forty-three percent of nonwhite STEM workers feel they are making less money at this point in their career than they expected, compared to 30 percent of white workers.[29]

Male and female current STEM workers have similar views about how their current compensation

Figure 14. Deriving a Sense of Identity from Work, by Gender



Note: Based on responses of those who currently work in STEM. The question's wording was: "Regardless of your current employment status, here are two different ways some people look at their job. Some people get a sense of identity from their job. For other people, their job is just what they do for a living. Which of these best describes the way you usually feel?"
Source: AEI STEM Education and Workforce Survey, 2019.

compares to their expectations. Sixty-six percent of men and 64 percent of women say they are making about as much or more than they expected.

Sense of Identity. There are many reasons STEM workers chose to do the work they do, but for most, it does not contribute to their sense of self. Less than half (48 percent) of STEM workers report they gain a sense of identity from their job, while more than half (52 percent) say it is just what they do for a living.

As Figure 14 shows, there are considerable differences by gender. Sixty percent of female workers say they get a sense of identity from their job, while only 42 percent of male workers say the same. A majority (57 percent) of male workers say their current job is just something they do for a living.

Younger STEM workers are also less likely to derive a sense of identity from their job. Only 42 percent of younger workers (under age 35) say they gain a sense of identity from their job, while 58 percent say it is just something they do for a living. In contrast, a majority (54 percent) of late-career workers (age 50 to 64) say they derive a sense of identity from their work.

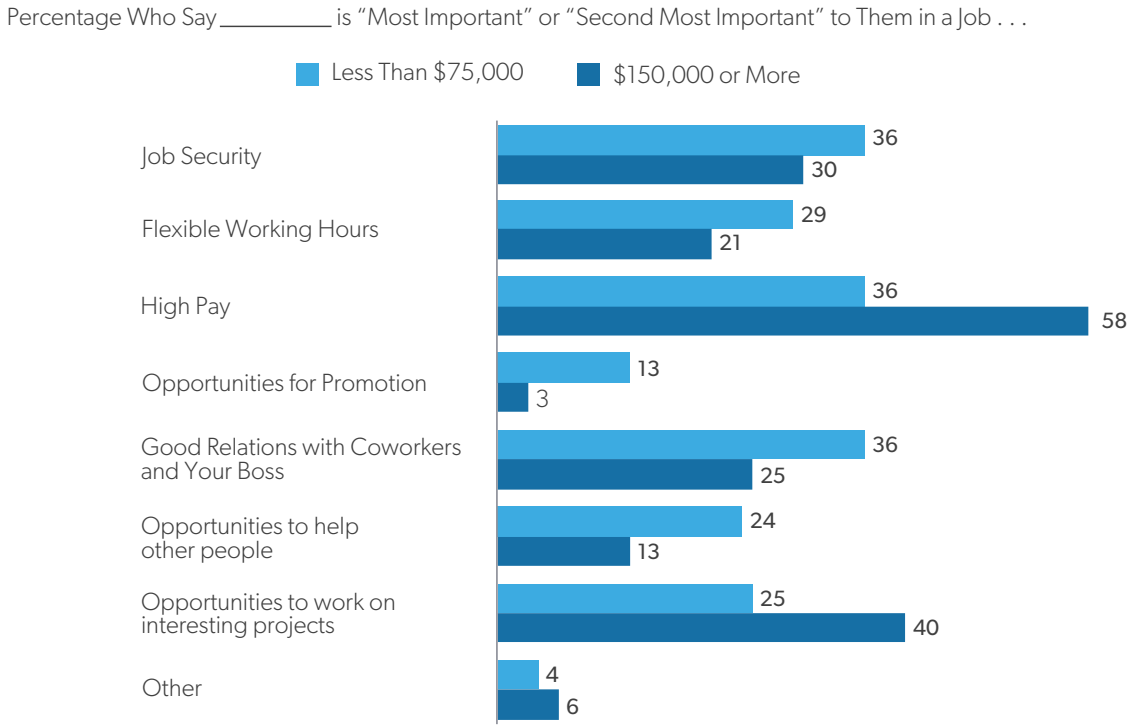
STEM workers with higher levels of formal education are more likely to say their job gives them a sense of identity than are those with less formal education. Fifty-nine percent of STEM workers with graduate degrees (master's or higher) get a sense of identity from their job, compared to 41 percent of those with a bachelor's degree or less formal education.

Most Important Factor in a Job. STEM workers do not agree on what they most value in a job. When asked which aspects of employment are most important or second-most important to them in a job, four in 10 (40 percent) STEM workers rank high pay as one of their top two. Thirty-five percent name opportunities to work on interesting projects as one of the top-two aspects they care about. Thirty-four percent rank job security in the same manner, and about three in 10 mention good relations with coworkers and their boss (30 percent) or flexible working hours (29 percent). Fewer cite opportunities to help other people (17 percent) and opportunities for promotion (8 percent).

As Figure 15 shows, STEM workers with lower annual incomes (less than $75,000 per year) are more likely to value roles in which they can serve others than are those with higher incomes ($150,000 or more). Twenty-four percent of lower-income STEM workers rank opportunities to help other people as one of the top-two most important aspects of a job, compared to 13 percent of higher-income workers. Lower-income workers are also more likely to value collegiality in their workplace (36 percent versus 25 percent). In contrast, higher-income workers are more likely to prioritize high pay (58 percent versus 36 percent) and opportunities to work on interesting projects (40 percent versus 25 percent).

There are stark divisions between male and female workers in what they value in a job. Male workers are more likely than female workers are to prioritize high pay. (Forty-seven percent versus 28 percent name it as one of the top-two most important aspects of a job.) In contrast, female workers are more likely to

Figure 15. Top-Two Most Important Aspects of a Job for STEM Workers, by Income



Note: Based on responses of those who work in STEM. Income is based on an individual's self-reported annual pay before taxes from his or her current job. Figures add to more than 100 percent because they reflect the combined responses to two separate questions. Each percentage represents the combined total who selected a response as "most" or "second-most" important. Unless respondents selected "other" as most important, they were not permitted to select the same job aspect as both most and second-most important.
Source: AEI STEM Education and Workforce Survey, 2019.

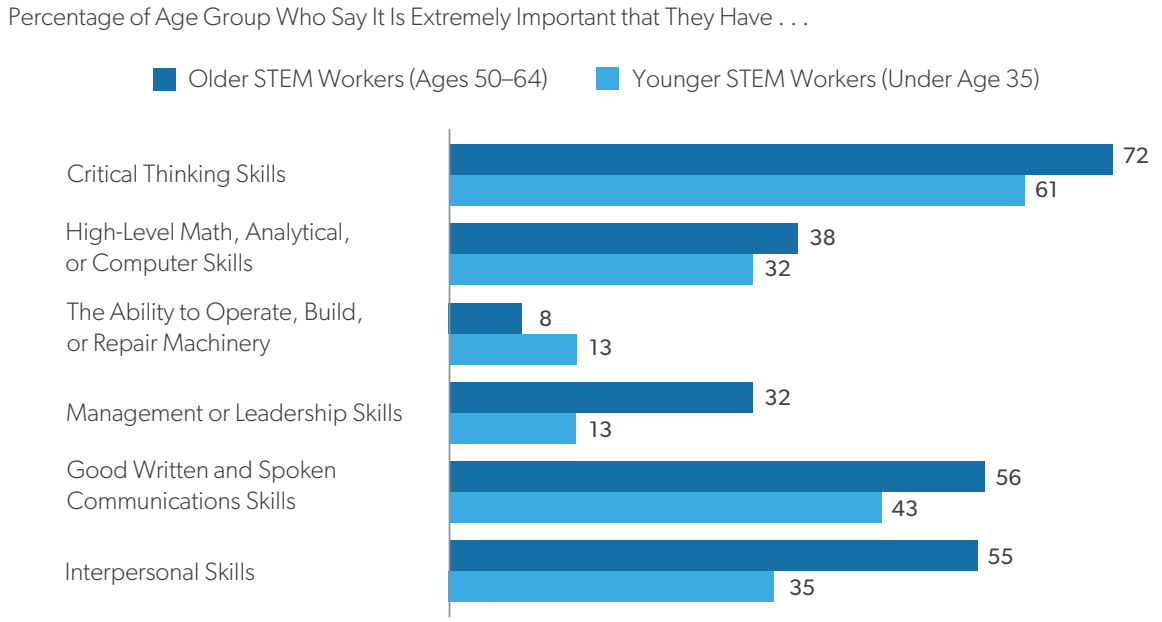
see collegiality in the workplace (38 percent versus 27 percent) and opportunities to help other people (26 percent versus 13 percent) as one of the top-two things that matter in a job.

The Value of Workplace Skills: Critical Thinking, Management, Communications, and Interpersonal. Of the various skill sets required to be successful in STEM, none were mentioned more frequently by STEM workers as being important to their job than was critical thinking. About seven in 10 (69 percent) STEM workers say having critical thinking skills, such as evaluating facts and making informed decisions, is extremely important for them to do their job.

About half (49 percent) of STEM workers say good written and communications skills are extremely important. A similar percentage (46 percent) say it is extremely important to have interpersonal skills, such as getting along with people. Fewer workers say it is extremely important to have high-level math, analytical, or computer skills (36 percent); management or leadership skills (25 percent); or the ability to operate, build, or repair machinery or equipment (12 percent).

There is a wide gender gap in the perceived importance of various skills. Female STEM workers are far more likely than male workers are to value communications and interpersonal ability. Nearly six in 10 (58 percent) female workers, compared to only 41 percent of male workers, say having interpersonal skills is extremely important in their current occupation. Female workers are also more likely than male workers are to say that communication skills are extremely important (57 percent versus 46 percent). Male and female workers are about equally likely to

Figure 16. Skills STEM Workers Say Are Important to Do Their Job, by Age Group



Note: Based on responses of those who work in STEM. The question's wording was: "How important is it that you have the following skills to do your job? Extremely important, very important, somewhat important, not too important, not at all important?"
Source: AEI STEM Education and Workforce Survey, 2019.

prioritize critical thinking (67 percent versus 71 percent) and high-level math skills (37 percent versus 31 percent).

Views Also Vary by Age. As Figure 16 shows, older STEM workers (age 50 to 64) are more likely than young workers (under age 35) are to say communications skills are extremely important (56 percent versus 43 percent). Younger STEM workers also tend to value interpersonal skills less than older workers do. A majority (55 percent) of older STEM workers say getting along with other people is an extremely important part of their job, while only 35 percent of those under age 35 say the same. STEM workers who make less than $75,000 a year are less likely than are those making $150,000 or more per year to say good communication skills are extremely important for their job (41 percent versus 59 percent) and to say interpersonal skills are extremely important (42 percent versus 55 percent).

Performance Pressures and Opportunities for Learning a Skill and Training. STEM workers report high expectations and support from employers for upskilling (i.e., adding new or increasing existing knowledge, skills, and abilities) to improve their technical skills. Overall, roughly three-quarters (73 percent) of STEM workers report they often or sometimes feel pressure to acquire new skills while working in STEM fields. Twenty-seven percent of STEM workers report they seldom or never feel pressure to augment their skills.

Early-career workers (under age 35) are somewhat more likely to report feeling pressure than older workers are, with 79 percent reporting often or sometimes feeling the need to bone up on new skills and technologies. But a considerable number (69 percent) of late-career STEM workers (between age 50 to 64) report they also feel pressure to acquire additional skills or experience. Similar numbers of male and female STEM workers say their current employer

provides resources to assist workers in acquiring new skills (78 percent versus 83 percent).

Although STEM workers generally feel pressure to continue skill development, most workers also say their employer supports employees with training opportunities. Nearly eight in 10 (79 percent) STEM workers report that their employers provided resources for training to help workers acquire new skills and develop their talents. Only 20 percent say their employer does not. This view is particularly pronounced among younger workers; 84 percent report that their employer provides access to training. Roughly three-quarters (76 percent) of late-career STEM workers say the same.

There is a larger gap between workers in small and large companies. Those employed by smaller companies are less likely than those employed by larger companies are to say their current employer provides resources to help train current staff (70 percent versus 87 percent). STEM degree holders who formerly worked in STEM but are now employed in other fields are less likely to say their former employers in STEM provided training opportunities than current STEM workers are to say their current employers provide such resources (79 percent versus 65 percent).

Workplace Collegiality and Proving Your Worth. A majority (56 percent) of STEM workers say they often or sometimes feel it necessary to prove themselves to gain their coworkers' respect. Forty-five percent of STEM workers report they rarely or never feel the need to prove themselves.

Experiences of male and female workers are largely similar. Fifty-six percent of female STEM workers and 55 percent of male workers say they feel they have to prove themselves on the job at least sometimes.

Younger workers are more likely than older workers are to say they feel the need to prove themselves. More than six in 10 (62 percent) STEM workers under age 35 say they often or sometimes feel the need to prove themselves, while half of workers age 50 to 64 say the same.

Workers who are newer to their current company are more likely to feel the need to prove themselves than are those who have worked at their company for a decade or longer. Fifty-nine percent of those with less than five years of experience at their current company and 61 percent of those with five to nine years of experience feel the need to prove themselves at least sometimes, compared to 49 percent of those with 10 to 19 years of experience and 44 percent of those who have worked at their company for 20 years or more.

STEM workers employed by larger companies report feeling more pressure to prove their worth than do those employed by startups or smaller companies. About half (52 percent) of STEM workers at small companies (fewer than 100 employees) say they feel the need to prove themselves at least sometimes, compared to 61 percent of those at large companies (with at least 2,000 employees).

The feeling that you are surrounded by people who are smarter than you are is fairly common among STEM workers. Roughly two-thirds (68 percent) of STEM workers report they often or sometimes feel this way. Only one-third (32 percent) report they rarely or never feel like their coworkers are smarter than they are. This feeling is pervasive among STEM workers crossing lines of education, gender, and race.

Younger workers report feeling this way more frequently than older workers do. Nearly three-quarters (74 percent) of workers under age 35 say they often or sometimes feel the people they work with are smarter than they are. Sixty-four percent of workers age 50 to 64 feel that way at least sometimes.

At larger companies (over 2,000 employees), the feeling that you are surrounded by smarter coworkers is somewhat more common. More than three-quarters (76 percent) of STEM workers at large firms say they sometimes or often feel like their coworkers are smarter than they are, compared to 60 percent of those employed by smaller firms (fewer than 100 employees).

Despite feeling pressure to prove their worth and being surrounded by smart coworkers, STEM workers perceive their workplaces as being mutually supportive environments. Eighty-nine percent of STEM workers say people in their workplace were generally willing to help each other, while just 10 percent say coworkers were only looking out for themselves.

Threats from Automation, Artificial Intelligence, and Advances in Technology. Most STEM workers do not feel threated by technological advances, such as automation and artificial intelligence. Only 15 percent of STEM workers believe it is likely that their current job will be eliminated within the next 20 years because of new technology, automation, robots, or artificial intelligence. More than eight in 10 workers say it is not too likely (48 percent) or not at all likely (35 percent) this will come to pass.

Older workers are generally more sensitive to the threats automation and technological advancements in the industry pose. Only 10 percent of younger workers (younger than 35 years old) say it is at least somewhat likely that their job could be eliminated within the next 20 years. More than twice (22 percent) as many late-career workers (age 50 to 64) share this view.

Leaving the Field. Few STEM workers have given serious thought to leaving their field. Of Americans working in STEM, only 22 percent report that they have "seriously considered" leaving the field to go work in another occupation. Male and female STEM workers are about as likely to say they considered leaving the field (23 percent versus 19 percent, respectively). Mid-career workers (age 35 to 49) are more likely than younger workers are to say they have thought about leaving STEM. Twenty-eight percent of mid-career workers report having given it serious consideration, compared to 18 percent of STEM workers younger than 35 years old. Twenty-one percent of those age 50 to 64 report having seriously considered it.

Avoiding or Leaving the STEM Field

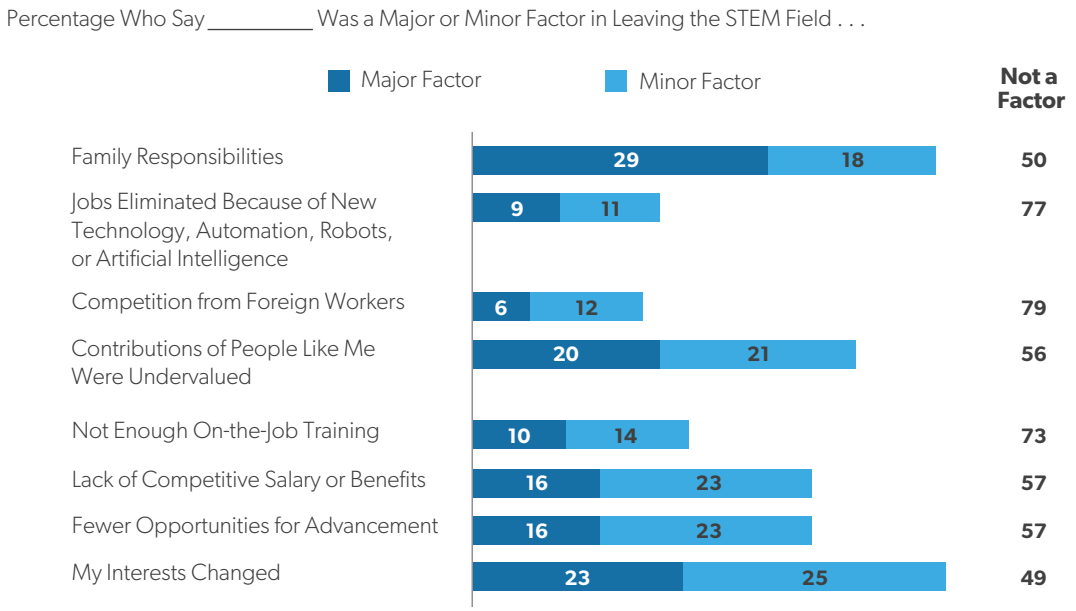
In the final section, we examine who is leaving STEM and why. We begin by comparing how different demographic characteristics relate to the likelihood of leaving the STEM field, and then we review the reasons "leavers" say they are no longer working in the field and whether they are interested in returning. We conclude by examining former STEM workers' satisfaction with their new field of work and their reflections on their time in STEM.

We find that educational attainment is predictive of propensity to exit, with higher-educated respondents being less likely to leave the field. The most common reasons those under age 65 cite for leaving are changing interests and family responsibilities, although associate degree holders are more likely than undergraduate and advanced degree holders are to cite a lack of opportunity to advance in the workplace as a factor. Those who have left STEM are, perhaps predictably, slightly more critical of their experience in STEM than are those who still work in the field, but a majority still hold positive views of the STEM career field.

STEM Degrees and STEM Workers. Among STEM degree holders of working age (under age 65), 60 percent say they work in STEM fields. Twenty percent work in other fields, including 9 percent who have never worked in STEM and 11 percent who have left the STEM field to pursue a career in a different field. Another 15 percent are former STEM workers who are not employed. (Five percent are retired; 10 percent are not working for other reasons.) Recent research has suggested that most STEM degree-holders who leave the STEM field do so relatively early on in their career.[30] Our analysis echoes this, finding that a majority (65 percent) of working-age STEM degree holders who left STEM careers worked in the field for less than a decade.

To better assess the extent to which educational background, gender, racial and ethnic identity, or some other factor might be related to the propensity of STEM workers to leave the field, we conducted a multivariate logistic regression model. The model included basic demographic attributes, such as age, gender, race and ethnicity, marital status, education level, individual income, and region (based on the US Census definition). The model also included self-identified political ideology. The model was conducted among only working-age Americans (under age 65) with a STEM educational background who spent at least some time working in the STEM field.

Figure 17. Reasons Working-Age Former STEM Workers Are Not Working in STEM



Note: Based on responses of former STEM workers under age 65. The question's wording was: "How much of a factor, if at all, were the following in why you no longer are working in a STEM occupation or field?"
Source: AEI STEM Education and Workforce Survey, 2019.

The results show a strong relationship between gender and educational background and likelihood of leaving the STEM field. Even when including a robust set of demographic and geographic variables in the model, propensity to leave the STEM field is significantly higher among those who have a terminal associate degree and among female workers. Americans with STEM backgrounds whose highest degree is an associate degree have a 35 percent probability of leaving STEM.[31] In contrast, Americans with a master's or doctorate degree who hold a degree (bachelor's or graduate) in STEM and have worked in a STEM field have a 24 percent probability of leaving. Notably, STEM-educated Americans with a terminal bachelor's degree are not significantly more likely to leave than those with advanced degrees are.

Gender appears to have a similar effect to education. Women with STEM backgrounds are significantly more likely than men are to leave the field, even controlling for demographic differences. Women with STEM degrees who have worked in the STEM field have a 40 percent probability of leaving, while men have only a 20 percent probability.

Although Hispanics with STEM educational backgrounds appear to demonstrate a higher propensity to leave the STEM field, after controlling for differing educational levels, the difference between Hispanic and non-Hispanic workers is not significant.

Why Do STEM Workers Leave STEM Jobs? As Figure 17 shows, the most common reason STEM workers give for why they no longer work in STEM is that their interests changed. Half (48 percent) of former STEM workers under age 65 say that shifting professional interests was a major or minor factor in their decision to leave.[32] Nearly as many (47 percent) say that family responsibilities were a significant factor in their decision-making. Four in 10 STEM workers who left the field cite feeling undervalued (41 percent), having few opportunities for advancement (39 percent), or lacking a competitive salary or benefits (39 percent). Fewer former STEM workers say lack of on-the-job training (24 percent), jobs eliminated because of automation (20 percent), or competition from foreign workers (18 percent) were considerations.

There are few differences between younger and older former STEM workers of working age. However, younger former STEM workers (under age 50) are more likely than those who are older (age 50 to 64) are to say that lack of competitive salary or benefits is a reason they left the field (44 percent versus 31 percent, respectively). Fifty-two percent of younger former STEM workers cite family responsibilities as a factor, compared to 41 percent of former STEM workers age 50 to 64.

Comparing the reasons given by working-age former STEM workers with bachelor's degrees or less and those with advanced degrees, there are significant differences on two notable factors. Associate or bachelor's degree holders are more likely than those with advanced degrees are to say few opportunities for advancement in STEM were a factor in their decision to leave the field (44 percent versus 30 percent). They are also more likely than advanced degree holders are to say family responsibilities are a reason they are no longer working in STEM (52 percent versus 36 percent).

As Figure 18 shows, when examined by race, further differences emerge among former STEM workers under age 65.[33] Nonwhite former STEM workers are more likely than white, non-Hispanic former STEM workers to cite not having enough on-the-job training as a factor in why they are no longer working in the STEM field (35 percent versus 18 percent). Forty-six percent of nonwhite former STEM workers say feeling that contributions of people like them were undervalued is a factor in why they no longer work in STEM; 38 percent of white former STEM workers give that response. About one in four (26 percent) nonwhite STEM workers cite jobs being eliminated by new technology or automation as a factor, compared to 16 percent of white former STEM workers.

Note that there is at least some evidence from the survey results that former STEM workers with less formal education may feel more affected by automation, artificial intelligence, and advances in technology than those with higher degrees would. Among former STEM workers of all ages, 27 percent of those with associate degrees say jobs being eliminated because of automation is a reason they are not working in STEM. In comparison, 15 percent of bachelor's degree holders and 11 percent of those with graduate degrees cited these issues as a factor in leaving the STEM field.[34]

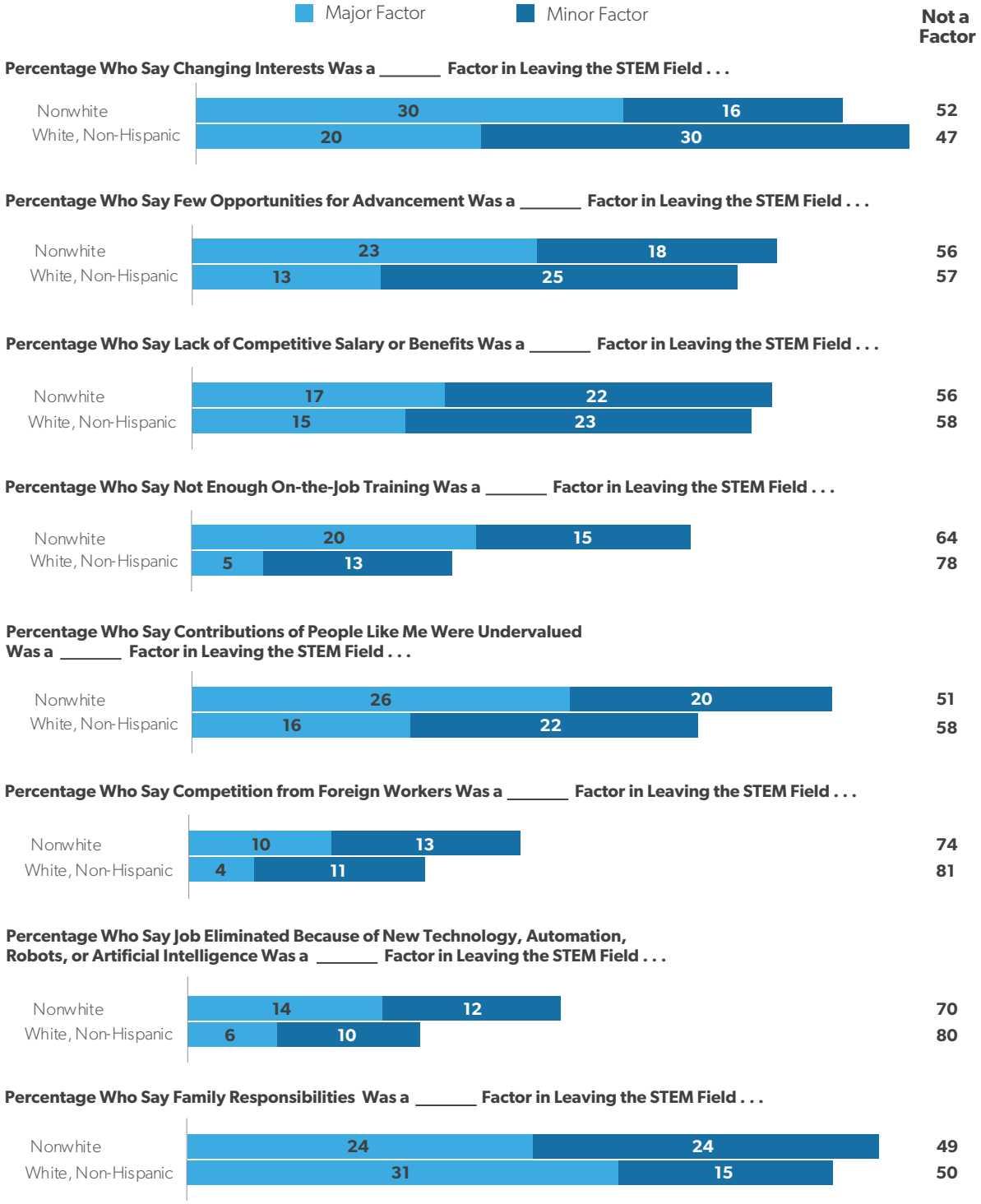
The Gender Gap: Family Responsibilities vs. Professional Interests. For female former STEM workers under age 65, the most widely cited reason for leaving the field is family responsibilities. Nearly six in 10 (59 percent) female former STEM workers cite family obligations as why they no longer work in the field, while only 35 percent of male former STEM workers say this is a factor. Male former STEM workers are significantly more likely than women are to say a shift in interest is an important factor for them (56 percent versus 40 percent). Men are also more likely than women are to cite jobs being eliminated because of new technology or automation as why they no longer work in STEM (26 percent versus 13 percent).

Are Former STEM Workers Interested in Returning? Despite concerns expressed by STEM workers who left their careers in STEM to pursue other career opportunities, many would consider returning. Fifteen percent of working-age former STEM workers say they are actively looking for opportunities to work in STEM. More than half (56 percent) say they are not looking but would consider it. Twenty-eight percent say they would not consider returning to STEM.

Among those of working age who have exited the STEM field, men are more likely than women are to say they are actively looking to get back into STEM. More than one in five (23 percent) male former STEM workers say they are currently exploring opportunities, compared to only 6 percent of female former STEM workers. However, roughly two-thirds (65 percent) of female former STEM workers say they would consider returning to the field.

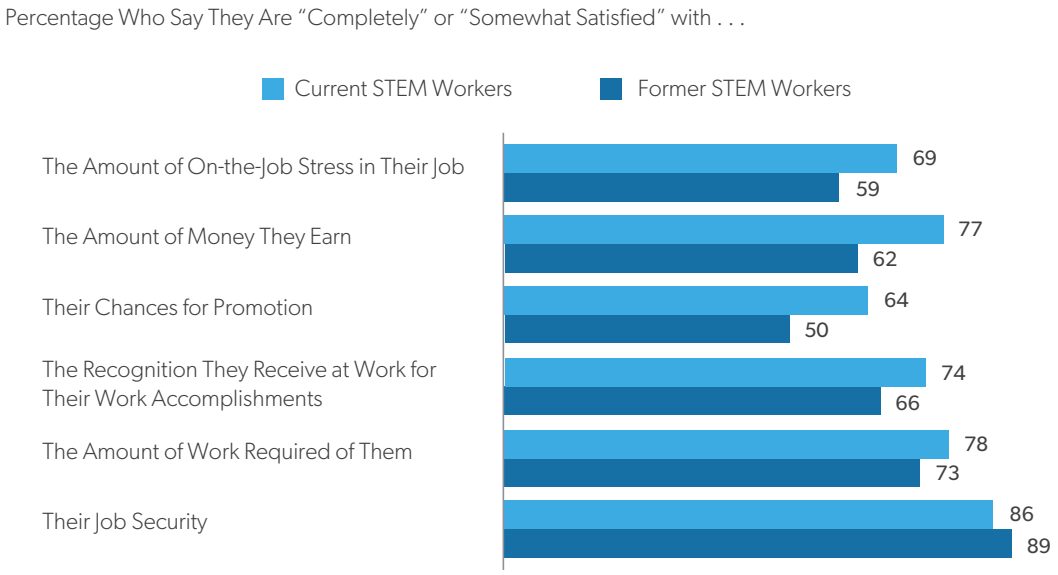
Current Job Satisfaction of Former STEM Workers and Reflections on Their Time in STEM. We asked all former STEM workers who are employed in other fields to think about their current level of job satisfaction compared to their time

Figure 18. Reasons for No Longer Working in STEM, by Race and Ethnicity



Note: Based on responses of former STEM workers under age 65. There were 82 nonwhite former STEM workers of working age in the sample. Results should be interpreted with caution. The question's wording was: "How much of a factor, if at all, were the following in why you no longer are working in a STEM occupation or field?"
Source: AEI STEM Education and Workforce Survey, 2019.

Figure 19. Satisfaction with Job Characteristics, by Current and Former STEM Workers



Note: Based on responses of current STEM workers and former STEM workers under age 65. Question's wording was: "Here is a list of job characteristics. For each, please say how satisfied or dissatisfied you are with your current job or employment situation."
Source: AEI STEM Education and Workforce Survey, 2019.

working in STEM. Roughly eight in 10 report they are either more satisfied (54 percent) or about as satisfied (25 percent) with their current job compared to their STEM jobs. Only 20 percent say they are less satisfied in their current job.

As Figure 19 shows, the majority of former STEM workers employed in non-STEM fields report being satisfied with various aspects of their current jobs, and on most measures, their level of satisfaction is comparable to that of people currently working in STEM fields—with a few exceptions. Fewer former STEM workers than current STEM workers say they feel satisfied with the amount of money they earn in their current jobs (62 percent versus 77 percent). More than half (51 percent) of former STEM workers employed outside the field say they are currently making less money than they expected at this point in their career. About one in three (34 percent) current STEM workers say the same.

Former STEM workers in non-STEM fields are also generally less satisfied with their advancement prospects than are STEM degree holders employed in STEM occupations. Fifty-one percent of former STEM workers say they are satisfied with their chances for promotion in their current jobs, compared to 64 percent of current STEM workers.

When asked to look back on their time working in STEM, those now employed in non-STEM fields give somewhat less favorable impressions of the workplace collegiality and employer support they experienced in STEM than current STEM workers do, though their feelings are still largely positive. Twenty-eight percent of those who have left and work in other fields say that most of the time their colleagues in STEM were just looking out for themselves, compared to 10 percent of current STEM workers who say that about their coworkers. Those who have left STEM and work in other fields are somewhat less likely than current STEM workers are to report that their employers in STEM provided resources or training to help workers acquire new skills and develop their talents (65 percent versus 79 percent).

Advice to Young People. No metric is more telling for how STEM workers feel about their field than is their willingness to recommend a STEM career to someone else. There is near unanimity among current STEM workers in recommending a job or career in STEM. Ninety-five percent of those working in STEM say they would recommend a career in STEM to a young person looking for career advice. Only 4 percent say they would not. Even 85 percent of former STEM workers who are currently employed in another occupation say they would still recommend a career in STEM.

Conclusion

Our survey of Americans with STEM degrees shows considerable hope for the current and future state of the STEM field. STEM workers, like most American workers, are fairly content with their educational choices, jobs, salaries, and opportunities for advancement. They derive great satisfaction from their work and feel they are making significant contributions to the world through it, even if the work does not really define them. As noted above, perhaps the most important measure of STEM career potential is these workers' willingness to recommend their field to the next generation. It is a test that STEM careers pass with flying colors.

Meanwhile, this sense of satisfaction is not evenly shared. Women, minorities, and those at the lower end of the STEM education spectrum report less consistently positive experiences. Furthermore, substantial shares of women and people of racial backgrounds underrepresented in the STEM workforce believe that people like them face more obstacles to getting ahead in STEM than they do in other industries. This is a genuine problem in an environment in which diversifying the STEM workforce is seen as an important strategy for expanding workforce opportunities for minority and low-income populations and narrowing growing income gaps between the most- and least-prosperous sectors of American society. If STEM education and careers continue to provide among the best professional opportunities in our high-technology economy, finding ways of increasing access to those careers for nonwhite and economically disadvantaged populations takes on an even higher level of importance.

Related to this challenge are concerns expressed by leading experts in STEM technology that the overwhelmingly white and male makeup of many STEM occupations has, and continues to, introduce unintentional bias into technology systems, especially artificial intelligence and computing. This has led to some embarrassing episodes for the technology industry (e.g., the "unprofessional hair" controversy at Google) in which unexamined and unchecked bias in the workforce allowed assumptions to take hold in algorithms, resulting in bias and discrimination toward racial minorities. These influences are subtle and unintentional but damaging nonetheless to the reputation of the industry and the functioning of the systems and products they provide to the public. Increasing the participation, advancement, influence, and longevity of workers who can help provide a diversity of perspectives that will prevent unintentional bias will help make the American STEM sector more representative of the population it serves.

Acknowledgments

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Brent Orrell is a resident fellow at the American Enterprise Institute, where he focuses on expanding opportunity for all Americans through improved work readiness and job training and improving the performance of the criminal justice system through rehabilitation and prisoner reentry programs.

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Appendix A

Table A1. STEM Degree-Holder Respondent Demographics

An asterisk (*) replaces percentages greater than zero but less than 0.5 percent.

Employment Status		
	Current STEM Worker	
		n = 652
		52%
	Former STEM	
		n = 566
		35%
	Never STEM/Never Employed	
		n = 147
		12%
	Refused to Answer	
		n = 3
		*
Gender		
	Male	
		n = 973
		65%
	Female	
		n = 395
		35%
Age		
	18–29 Years Old	
		n = 157
		18%
	30–49 Years Old	
		n = 467
		41%
	50–64 Years Old	
		n = 406
		26%
	65 Years Old and Older	
		n = 338
		15%

Race		
	White, Non-Hispanic	
		n = 1,027
		70%
	Black/African American	
		n = 77
		7%
	Asian or Hawaiian/Pacific Islander	
		n = 124
		14%
	American Indian or Alaska Native, Non-Hispanic	
		n = 4
		*
	Hispanic	
		n = 93
		9%
	2+ Races	
		n = 43
		1%
Work status		
	Working Full Time	
		n = 803
		64%
	Working Part Time	
		n = 79
		6%
	Retired	
		n = 361
		17%
	Homemaker or Stay-at-Home Parent	
		n = 46
		5%
	Student	
		n = 28
		3%
	Other	
		n = 51
		5%

Highest Level of Degree Attainment	Associate Degree	
		n = 177
		15%
	Bachelor's Degree	
		n = 602
		50%
	Master's Degree	
		n = 383
		23%
	Professional or Doctorate Degree	
		n = 206
		13%
Geographic Area		
	Northeast	
		n = 255
		18%
	Midwest	
		n = 301
		20%
	South	
		n = 441
		35%
	West	
		n = 371
		27%
Occupation		
	Management	
		n = 121
		9%
	Computer and Mathematical	
		n = 188
		14%
	Architecture and Engineering	
		n = 105
		9%
	Not Asked	
		n = 381
		23%
	Other	
		n = 573
		45%

Earnings		
	$49,999 or Less	
		n = 155
		20%
	$50,000–$99,000	
		n = 315
		36%
	$100,000–149,999	
		n = 206
		22%
	$150,000 or More	
		n = 145
		16%
	Preferred Not to Answer/Refused	
		n = 61
		6%
Degree		
	Computer and Information Sciences	
		n = 264
		20%
	Engineering	
		n = 361
		26%
	Mathematics and Statistics	
		n = 136
		10%
	Physical Sciences	
		n = 130
		8%
	Biology and Life Sciences	
		n = 226
		17%
	Other	
		n = 251
		19%

Note: Appendix A represents the entire smaple from the survey (*n* = 1368).
Source: AEI STEM Education and Workforce Survey, 2019.

Table A2: STEM Workers Respondent Demographics

Gender		
	Male	
		n = 491
		71%
	Female	
		n = 161
		29%
Age		
	18–29 Years Old	
		n = 157
		18%
	30–49 Years Old	
		n = 467
		41%
	50–64 Years Old	
		n = 406
		26%
	65 Years Old and Older	
		n = 338
		15%
Highest Level of Degree Attainment	Associate degree	
		n = 67
		11%
	Bachelor's degree	
		n = 312
		52%
	Master's degree	
		n = 169
		23%
	Professional or Doctorate Degree	
		n = 104
		14%

Race		
	White, Non-Hispanic	
		n = 475
		68%
	Black/African American	
		n = 29
		5%
	Asian or Hawaiian/Pacific Islander	
		n = 74
		16%
	American Indian or Alaska Native, Non-Hispanic	
		n = 2
		*
	Hispanic	
		n = 49
		8%
	2+ Races	
		n = 23
		1%
Work Status		
	Working Full Time	
		n = 614
		94%
	Working Part Time	
		n = 38
		6%
	Retired	
		n = 0
		0%
	Homemaker or Stay-at-Home Parent	
		n = 0
		0%
	Student	
		n = 0
		0%
	Other	
		n = 0
		0%

Geographic Area		
	Northeast	
		n = 109
		17%
	Midwest	
		n = 145
		20%
	South	
		n = 223
		37%
	West	
		n = 175
		26%
Occupation		
	Management	
		n = 76
		11%
	Computer and Mathematical	
		n = 163
		24%
	Architecture and Engineering	
		n = 97
		15%
	Life, Physical, and Social Sciences	
		n = 43
		6%
	Not Asked	
		n = 15
		3%
	Other	
		n = 258
		41%

Earnings		
	$49,999 or Less	
		n = 69
		12%
	$50,000–$99,000	
		n = 244
		38%
	$100,000–149,999	
		n = 168
		25%
	$150,000 or More	
		n = 122
		18%
	Preferred Not to Answer/Refused	
		n = 49
		7%
Degree		
	Computer and Information Sciences	
		n = 151
		24%
	Engineering	
		n = 201
		31%
	Mathematics and Statistics	
		n = 47
		7%
	Physical Sciences	
		n = 52
		7%
	Biology and Life Sciences	
		n = 86
		13%
	Other	
		n = 115
		18%

Note: Appendix B represents all survey respondents currently working in the STEM field (*n* = 652). An asterisk (*) replaces percentages greater than zero but less then 0.5 percent.
Source: AEI STEM Education and Workforce Survey, 2019.

Appendix B. Topline Questionnaire

Total *n* = 1,368 adults with an associate degree or higher who say they have a STEM degree.
Interview dates: August 1–16, 2019.

Note: All results shown are percentages. An asterisk (*) replaces percentages greater than zero but less than 0.5 percent. Responses may not total to 100 percent due to rounding.

ASK ALL:

Q.1 Growing up in your family, was it generally expected that you would get a job immediately after high school, go to college after high school, or go to a trade or vocational school?

Go to a four-year college	74
Go to a community college/two-year college	8
Go to a trade school or vocational program	1
Immediately get a job after high school	5
Family did not talk about it	12
Refused	*

Q.2 Which, if any, of these things did you seriously consider before selecting your major? Select all that apply. [RANDOMIZE RESPONSE OPTIONS 1–5]

Job opportunities in the field	54
The average salary in the field	36
Opportunities to balance work and family	13
Job security	29
My interest in the subject matter	86
Other (Please specify)	4
Refused	*

Q.3 Thinking back to when you were in college, is there anything you would have done differently to help you succeed in today's labor market or workplace? Select all that apply. [RANDOMIZE RESPONSE OPTIONS 1–6]

Chosen a different major	20
Taken more classes to better prepare for a career	17
Gone to a different college or university	14
Chosen not to go to college	3
Taken advantage of more internship opportunities	29
Taken more classes outside my major	16
None of these	40
Refused	*

Q.4 Which of the following applies to the education level of your parents? [ROTATE]

Both have at least a college degree	33
Only one has a college degree	26
Neither has a college degree	40
Refused	*

Q.5 Which of the following best describes your current work situation?

Working full -time (at least 40 hours per week)	64
Working part -time	6
Retired	17
A homemaker or stay-at-home parent	5
A student	3
Unemployed, but looking for work	2
Unemployed, and not looking for work	1
Disabled and unable to work	1
Refused	*

IF STUDENT, HOMEMAKER, UNEMPLOYED BUT LOOKING FOR WORK, UNEMPLOYED AND NOT LOOKING FOR WORK, OR DISABLED [N = 123], ASK:

Q.6 After you graduated college, were you ever employed in a full-time or part-time job where you worked for pay? [RANDOMIZE RESPONSE OPTIONS 1–3]

Yes, I had a full -time job (at least 40 hours per week)	61
Yes, I had a part -time job	14
Yes, I had both a full -time and part -time job(s)	12
No, I have not had a job working for pay [ANCHOR; MAKE EXCLUSIVE]	13

IF RETIRED OR EMPLOYED IN THE PAST [N = 471], ASK:

Q.7 In what year did you stop working at your last job?

Before 2000	10
Between 2000 and 2009	22
Between 2010 and 2019	68
Refused	2

IF EVER EMPLOYED [N = 1,353], ASK:

Q.8 What was the MOST important thing that helped you get your first job after college? [RANDOMIZE]

The specific skills and training acquired as part of my college education	32
The reputation of the college or university I attended	6
My grades, coursework, and academic experience	17
Personal or family connections	12
Internship or workplace experience	23
Other (Please specify)	10
Refused	*

IF CURRENTLY EMPLOYED [N = 882], ASK:

Q.9 Do you currently work in a job or career in science, technology, engineering, or math (STEM), or do you work in a different field or occupation? [ROTATE]

Yes, currently work in STEM	74
No, do not currently work in STEM	26

IF EVER EMPLOYED [N = 1,353], ASK:

Q.10 After graduating college, have you spent most of your career working in a STEM field or occupation, have you spent most of your career working in a different field or occupation, or have you never worked in STEM? [ROTATE RESPONSE OPTIONS 1 AND 2]

Mostly worked in STEM	71
Mostly worked in a different field or occupation but spent some time working in STEM	18
Have never worked in STEM	11
Refused	*

IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST [N = 566], ASK:

Q.11 In what year did you stop working in a STEM field or occupation?

Before 2000	20
Between 2000 and 2009	24
Between 2010 and 2019	51
Refused	5

IF EVER EMPLOYED IN STEM [N = 1,218], ASK:

Q.12 Since graduating your last year in college, roughly how many years have you spent working in a science, technology, engineering, or math (STEM) occupation or field?

Less than one year	5
1–2 years	9
3–4 years	11
5–9 years	17
10–19 years	21
20 years or more	37
Refused	*

IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST [N = 566], ASK:

Q.13 Currently, are you actively looking for an opportunity to work in a STEM field or occupation, or not?

Yes	10
Not actively looking but would consider returning to STEM	47
Not actively looking and would not consider returning to STEM	42
Refused	1

IF EVER EMPLOYED IN STEM [N = 1,218], ASK:

Q.14 **IF CURRENTLY EMPLOYED IN STEM, INSERT:** In your current job, do you mostly work with people who also have a STEM background or mostly with people who do not have a STEM background?
IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST, INSERT: For most of your time working in a STEM field or occupation, did you mostly work with other people who also had a STEM background or mostly with people who did not have a STEM background? **[RANDOMIZE RESPONSE OPTIONS 1 AND 2]**

Mostly with other people with a STEM background	58
Mostly with people without a STEM background	18
About equally with both	22
Don't know	2
Refused	*

IF NOT CURRENTLY EMPLOYED IN STEM [N = 714], ASK:

Q.15 Held for future release.

IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST [N = 566], ASK:

Q.16 How much of a factor, if at all, were the following in why you no longer are working in a STEM occupation or field? **[RANDOMIZE ITEMS] [ROTATE RESPONSE OPTIONS 1:3, 3:1]**

A. My interests changed

Major factor	21
Minor factor	20
Not a factor	56
Refused	3

B. Few opportunities for advancement

Major factor	12
Minor factor	18
Not a factor	67
Refused	3

C. Lack of competitive salary or benefits

Major factor	11
Minor factor	17
Not a factor	67
Refused	4

D. Not enough on-the-job training

Major factor	7
Minor factor	10
Not a factor	80
Refused	3

E. Contributions of people like me were undervalued

Major factor	15
Minor factor	17
Not a factor	65
Refused	3

F. Competition from foreign workers

Major factor	4
Minor factor	8
Not a factor	84
Refused	3

G. Jobs eliminated as a result of new technology, automation, robots, or artificial intelligence

Major factor	7
Minor factor	9
Not a factor	41
Refused	4

H. Family responsibilities

Major factor	22
Minor factor	15
Not a factor	60
Refused	3

IF CURRENTLY EMPLOYED [N = 882], ASK Q17 AND Q18:

Now, thinking about your current job . . .

Q.17 About how many people work at the location where you work? Count part-time as well as full-time employees in all areas, departments, and buildings. [ROTATE RESPONSE OPTIONS 1:8; 8:1]

1 (Only me)	5
2–9	7
10–49	18
50–99	9
100–499	19
500–999	9
1,000–1,999	6
2,000 or more	26
Refused	*

Q.18 How long have you worked at your current company? [ROTATE 1:5; 5:1]

One year or less	14
2–4 years	29
5–9 years	23
10–19 years	20
20 or more years	14
Refused	*

IF NOT CURRENTLY EMPLOYED IN ANY FIELD AND NEVER EMPLOYED IN STEM OR (Q5 = Refused or Q6 = Refused) OR (Q9 = Refused AND Q10 ≠ 3) OR (Q9 = 2 AND Q10 = Refused)], SKIP TO Q30a.

OTHERWISE, IF CURRENTLY EMPLOYED IN ANY FIELD OR EVER EMPLOYED IN STEM [N = 1310], CONTINUE WITH Q19.

IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST [N = 566]: Thinking about when you worked in a STEM field or occupation . . .

IF CURRENTLY EMPLOYED IN STEM OR IF CURRENTLY EMPLOYED AND NEVER EMPLOYED IN STEM [N = 744], INSERT V1 FOR Q19–Q26.

IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST OR CURRENTLY EMPLOYED IN A NON-STEM FIELD BUT EMPLOYED IN STEM IN THE PAST [N = 566], INSERT V2 FOR Q19–Q26.

Q.19 **V1:** How often, if ever, do you feel that the people you work with are smarter than you?
V2: How often, if ever, did you feel that the people you worked with in STEM were smarter than you?
[ROTATE RESPONSE OPTIONS 1:4; 4:1]

Often	12
Sometimes	52
Rarely	28
Never	7
Refused	*

Q.20 **V1:** How often, if ever, do you feel the need to prove yourself at work in order to be respected by your coworkers?
V2: How often, if ever, did you feel the need to prove yourself at work in order to be respected by your coworkers when you worked in a STEM field or occupation? [ROTATE RESPONSE OPTIONS 1:4; 4:1]

Often	16
Sometimes	40
Rarely	29
Never	15
Refused	*

Q.21 **V1:** How often, if ever, do you feel pressure to learn a new skill, application, or program to do your job?
V2: How often, if ever, did you feel pressure to learn a new skill, application, or program when you worked in a STEM field or occupation? [ROTATE RESPONSE OPTIONS 1:4; 4:1]

Often	22
Sometimes	48
Rarely	23
Never	6
Refused	*

Q.22 **V1:** Does your current employer provide resources or training to help workers acquire new skills and develop their talents?
V2: During your time working in a STEM field or occupation, did your former employer(s) provide resources or training to help workers acquire new skills and develop their talents?

Yes	76
No	23
Refused	*

Q.23 **V1:** Would you say that most of the time people in your office are willing to help each other or that they are mostly looking out for themselves?
V2: During your time working in a STEM field or occupation, would you say that most of the time people were willing to help each other, or that they were mostly looking out for themselves? **[ROTATE RESPONSE OPTIONS]**

Willing to help each other	84
Just looking out for themselves	15
Refused	1

Q.24 **V1:** In your current job, do you normally work as part of a team, or do you mostly work on your own?
V2: During your time working in a STEM field or occupation, did you normally work as part of a team, or did you mostly work on your own? **[RANDOMIZE RESPONSE OPTIONS]**

Work as part of a team	66
Mostly work on my own	33
Refused	1

Q.25 **V1:** How important is it that you have the following skills to do your job?
V2: When you worked in a STEM field or occupation, how important was it that you had the following skills to do your job? **[RANDOMIZE ITEMS] [ROTATE RESPONSE OPTIONS 1:5; 5:1]**

A. Interpersonal skills, such as getting along with people

Extremely important	43
Very important	41
Somewhat important	13
Not too important	1
Not at all important	1
Refused	1

B. Good written and spoken communication skills

Extremely important	45
Very important	42
Somewhat important	11
Not too important	2
Not at all important	*
Refused	1

C. Management or leadership skills

Extremely important	24
Very important	30
Somewhat important	31
Not too important	12
Not at all important	3
Refused	1

D. The ability to operate, build, or repair machinery or equipment

Extremely important	12
Very important	12
Somewhat important	18
Not too important	25
Not at all important	33
Refused	1

E. High-level math, analytical, or computer skills

Extremely important	30
Very important	31
Somewhat important	25
Not too important	10
Not at all important	3
Refused	1

F. Critical thinking skills, such as evaluating facts and making informed decisions

Extremely important	62
Very important	28
Somewhat important	6
Not too important	1
Not at all important	1
Refused	1

Q. 26 **V1:** About how many of the people you regularly work with are . . .? Just give your best estimate. **V2:** When you worked in a STEM field or occupation, about how many of the people you regularly worked with were . . . ? Just give your best estimate. [RANDOMIZE LIST] [ROTATE RESPONSE OPTIONS 1:5; 5:1] IF CURRENTLY EMPLOYED IN STEM [N = 652], ASK:

A. Men

All of them	5
Most of them	49
About half	27
Less than half	14
Almost none or none of them	4
Refused	1

B. Over 50 years old

All of them	1
Most of them	8
About half	27
Less than half	48
Almost none or none of them	15
Refused	1

C. Under 30 years old

All of them	1
Most of them	13
About half	32
Less than half	41
Almost none or none of them	12
Refused	1

D. White

All of them	10
Most of them	54
About half	22
Less than half	10
Almost none or none of them	2
Refused	1

Q.27 Have you ever seriously considered leaving the STEM field to work in a different type of occupation or field?

Yes	22
No	78
Refused	*

IF CURRENTLY EMPLOYED [N = 881], ASK:

Q.28 Here is a list of job characteristics. For each, please say how satisfied or dissatisfied you are with your current job or employment situation. [RANDOMIZE ITEMS] [ROTATE RESPONSE OPTIONS 1:4; 4:1]

A. Your job security

Completely satisfied	42
Somewhat satisfied	44
Somewhat dissatisfied	9
Completely dissatisfied	4
Refused	1

B. The amount of work that is required of you

Completely satisfied	29
Somewhat satisfied	48
Somewhat dissatisfied	18
Completely dissatisfied	4
Refused	1

C. The recognition you receive at work for your work accomplishments

Completely satisfied	23
Somewhat satisfied	48
Somewhat dissatisfied	21
Completely dissatisfied	7
Refused	1

D. Your chances for promotion

Completely satisfied	18
Somewhat satisfied	44
Somewhat dissatisfied	27
Completely dissatisfied	10
Refused	1

E. The amount of money you earn

Completely satisfied	26
Somewhat satisfied	48
Somewhat dissatisfied	20
Completely dissatisfied	6
Refused	1

F. The amount of on-the-job stress in your job

Completely satisfied	19
Somewhat satisfied	47
Somewhat dissatisfied	25
Completely dissatisfied	8
Refused	1

IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST OR CURRENTLY EMPLOYED IN A NON-STEM FIELD BUT EMPLOYED IN STEM IN THE PAST [N = 137], ASK:

Q.29 Thinking about your time working in STEM compared to your current job, would you say you are generally more satisfied with your current job, less satisfied with your current job, or are you about as satisfied? [ROTATE RESPONSE OPTIONS 1:3; 3:1]

More satisfied with my current job	54
Less satisfied with my current job	20
About as satisfied	25
Refused	1

ASK ALL:

Q.30a Regardless of your current employment status, which of the following would you say is the MOST important to you in a job? [RANDOMIZE RESPONSE OPTIONS]

Job security	16
Flexible working hours	14
High pay	14
Opportunities for promotion	3
Good relations with coworkers and your boss	14
Opportunities to help other people	10
Opportunities to work on interesting projects	25
Other (Please specify)	4
Refused	1

Q.30b Which of the following would you say is the SECOND MOST important to you in a job? [PROGRAMMING INSTRUCTIONS: REMOVE SELECTED OPTION IN Q30a UNLESS SELECTED OTHER] [RANDOMIZE RESPONSE OPTIONS 1–7]

Job security	15
Flexible working hours	14
High pay	21
Opportunities for promotion	6
Good relations with coworkers and your boss	18
Opportunities to help other people	8
Opportunities to work on interesting projects	14
Other (Please specify)	2
Refused	1

IF CURRENTLY EMPLOYED [N = 882], ASK:

Q.31 How likely is it that the job you have now will be eliminated within the next 20 years as a result of new technology, automation, robots, or artificial intelligence? [ROTATE 1:4; 4:1]

Very likely	5
Somewhat likely	13
Not too likely	46
Not at all likely	36
Refused	*

ASK ALL:

Q.32 Regardless of your current employment status, here are two different ways some people look at their job. Some people get a sense of identity from their job. For other people, their job is just what they do for a living. Which of these best describes the way you usually feel? [ROTATE RESPONSE OPTIONS]

Sense of identity	51
Just what you do	48
Refused	1

IF CURRENTLY EMPLOYED [N = 882], ASK Q33 AND Q34:

Q.33 What is your annual pay, before taxes, at your current job(s)?

$14,999 or less	2
$15,000–$24,999	3
$25,000–$34,999	6
$35,000–$49,999	9
$50,000–$74,999	18
$75,000–$99,999	18
$100,000–$149,999	22
$150,000–$199,999	10
$200,000 or more	6
Prefer not to answer	6
Refused	1

Q.34 Thinking about your current annual pay, are you making more money than you expected at this point in your career, about as much money as you expected, or less money than you expected? [ROTATE RESPONSE OPTIONS]

Making more money	20
Making less money	38
Making about what I expected	42
Refused	*

IF EVER EMPLOYED IN STEM [N = 1,218], ASK:

Q.35 **IF CURRENTLY EMPLOYED IN STEM, INSERT:** Would you say that your experience working in a STEM occupation or field is fairly typical, or would you say your experience is somewhat unique?
IF NOT CURRENTLY EMPLOYED IN STEM BUT EMPLOYED IN STEM IN THE PAST OR CURRENTLY EMPLOYED IN A NON-STEM FIELD BUT EMPLOYED IN STEM IN THE PAST OR Refused Q9 or Q10, INSERT: Would you say that your experience working in a STEM occupation or field was fairly typical, or would you say your experience was somewhat unique? [ROTATE RESPONSE OPTIONS]

Fairly typical	53
Somewhat unique	46
Refused	1

ASK ALL:

Q.36 Compared to jobs in other industries, would you say jobs in STEM . . . ? [RANDOMIZE RESPONSE OPTIONS]

Offer higher pay than jobs in other industries	61
Offer lower pay than jobs in other industries	9
Offer similar pay to jobs in other industries	29
Refused	1

Q.37 Compared to jobs in other industries, would you say jobs in STEM . . . ? [RANDOMIZE RESPONSE OPTIONS]

Offer more opportunities for advancement than jobs in other industries	32
Offer fewer opportunities for advancement than jobs in other industries	16
Offer about the same number of opportunities for advancement as jobs in other industries	50
Refused	2

Q.38 Compared to jobs in other industries, would you say jobs in STEM . . . ? [RANDOMIZE RESPONSE OPTIONS]

Make a MORE meaningful contribution to society than jobs in other industries	49
Make a LESS meaningful contribution to society than jobs in other industries	4
Make about the same contribution to society as jobs in other industries	45
Refused	2

Q.39 Compared to jobs in other industries, would you say jobs in STEM . . . ? [RANDOMIZE RESPONSE OPTIONS]

Are more well respected than jobs in other industries	50
Are less well respected than jobs in other industries	6
Are respected about the same as jobs in other industries	42
Refused	2

Q.40 Based on what you know or have heard, how well do the following statements describe work in the STEM field or industry? [RANDOMIZE ITEMS] [ROTATE RESPONSE OPTIONS 1:4; 4:1]

A. People generally feel like they are replaceable.

Very well	11
Somewhat well	41
Not too well	41
Not at all well	4
Refused	2

B. Employers would rather hire new workers than invest in training their current workers.

Very well	11
Somewhat well	33
Not too well	44
Not at all well	10
Refused	2

C. There is high turnover among workers.

Very well	10
Somewhat well	35
Not too well	47
Not at all well	7
Refused	2

D. There are lots of opportunities to move up.

Very well	13
Somewhat well	56
Not too well	26
Not at all well	3
Refused	2

E. Employers work hard at building the skills of their workforce.

Very well	17
Somewhat well	57
Not too well	20
Not at all well	3
Refused	2

F. The benefits are generous.

Very well	17
Somewhat well	58
Not too well	20
Not at all well	3
Refused	2

G. The work is generally interesting.

Very well	38
Somewhat well	53
Not too well	6
Not at all well	1
Refused	2

Q.41 Compared to other fields and industries, do you think the following groups of people face more obstacles to getting ahead in STEM fields, about the same number of obstacles to getting ahead in STEM fields, or fewer obstacles to getting ahead in STEM fields? [RANDOMIZE ITEMS] [ROTATE RESPONSE OPTIONS 1:3; 3:1]

A. Men

More obstacles in STEM than in other fields	4
About the same in STEM as in other fields	54
Fewer obstacles in STEM than in other fields	40
Refused	3

B. Women

More obstacles in STEM than in other fields	41
About the same in STEM as in other fields	45
Fewer obstacles in STEM than in other fields	12
Refused	2

C. Black Americans

More obstacles in STEM than in other fields	31
About the same in STEM as in other fields	55
Fewer obstacles in STEM than in other fields	11
Refused	3

D. Hispanic Americans

More obstacles in STEM than in other fields	29
About the same in STEM as in other fields	59
Fewer obstacles in STEM than in other fields	10
Refused	3

E. Asian Americans

More obstacles in STEM than in other fields	6
About the same in STEM as in other fields	54
Fewer obstacles in STEM than in other fields	37
Refused	3

F. White Americans

More obstacles in STEM than in other fields	5
About the same in STEM as in other fields	64
Fewer obstacles in STEM than in other fields	29
Refused	2

G. People over age 50

More obstacles in STEM than in other fields	49
About the same in STEM as in other fields	40
Fewer obstacles in STEM than in other fields	8
Refused	3

H. People under age 50

More obstacles in STEM than in other fields	6
About the same in STEM as in other fields	60
Fewer obstacles in STEM than in other fields	32
Refused	2

I. Political conservatives

More obstacles in STEM than in other fields	11
About the same in STEM as in other fields	77
Fewer obstacles in STEM than in other fields	9
Refused	3

K. Parents with young children

More obstacles in STEM than in other fields	27
About the same in STEM as in other fields	64
Fewer obstacles in STEM than in other fields	6
Refused	2

Q.42 Suppose a young person came to you for advice on choosing a line of work or career. Would you recommend a career or job in science, technology, engineering, or math (STEM)?

Yes	92
No	7
Refused	1

Appendix C: Survey Methodology

The AEI STEM Education and Workforce Survey was designed and conducted by the American Enterprise Institute. Interviews were conducted among a random sample of 1,515 adults (age 18 or older) with an associate or higher-level degree in STEM living in the United States, including all 50 states and the District of Columbia. The final qualified sample included 1,368 respondents. One hundred and forty-seven respondents were removed from the main sample after interviewing was complete based on responses to an open-ended question specifying their STEM degree. Interviews were conducted in English using a self-administered design. All interviews were conducted among participants of the web-enabled "KnowledgePanel," a probability-based panel designed to be representative of the US general population, not just the online population. Interviewing was conducted between August 1 and August 16, 2019.

KnowledgePanel is a web-enabled, probability-based panel designed to be representative of the US population. Initially, participants are chosen scientifically by a random selection of telephone numbers and residential addresses. Persons in selected households are then invited by telephone or by mail to participate in the web-enabled KnowledgePanel. For those who agree to participate, but do not already have internet access, Ipsos provides at no cost a laptop and internet service provider connection. People who already have computers and internet service are permitted to participate using their own equipment. Panelists then receive unique log-in information for accessing surveys online and then are sent emails throughout each month inviting them to participate in research.

The data were weighted to adjust for gender by age, race, education, Census region by metropolitan status, and household income. All screened respondents before any screening were weighted to represent the 18 and over population with at least an associate degree using the 2018 March supplement of the US Census Bureau's Current Population Survey. The geodemographic of qualified respondents (i.e., with STEM-related degrees as screened in field) were allowed to fall out naturally.

The sample weighting was accomplished using an iterative proportional fitting process that simultaneously balances the distributions of all variables. Weights were trimmed to prevent individual interviews from having too much influence on the final results.

The use of survey weights in statistical analyses ensures that the demographic characteristics of the sample closely approximate the demographic characteristics of the target population. The margin of error for the qualified survey sample is +/– 2.9 percentage points at the 95 percent level of confidence. The design effect for the survey is 1.19. The margin of sampling error is higher and varies for results based on sub-samples.

SAMPLE SCREENING QUESTIONS

IF BACHELOR'S DEGREE OR ASSOCIATE DEGREE ONLY [N = 779], ASK:

SCR1a Was your degree in the field of science, technology, engineering, or math, commonly referred to as STEM? (This includes, but is not limited to, degrees in computer science, statistics, biology, physics, information technology, and environmental science) [ROTATE RESPONSES]

Yes, degree was in STEM-related field	1
No, degree was not in STEM-related field [TERMINATE]	2

IF ADVANCED DEGREE [N = 589], ASK:

SCR1b Were any of your degrees—bachelor's or graduate—in the field of science, technology, engineering, or math, commonly referred to as STEM? (This includes, but is not limited to, degrees in computer science, statistics, biology, physics, information technology, and environmental science) [ROTATE RESPONSES]

Yes, degree was in STEM-related field	1
No, degree was not in STEM-related field [TERMINATE]	2

IF SCRA1 = 1 OR SCR1B = 1 [N = 1,368], ASK:

SCR3 What was your STEM degree in?

OPEN END	1

IF SCRA1 = 1 OR SCR1B = 1 [N = 1,368], ASK:

SCR4 Did you get another degree, minor, or complete significant coursework in a field of study outside of STEM—for example, in business management, languages, or fine arts, or the social sciences? [ROTATE RESPONSES]

Yes	1
No	2

Notes

1. For example, a 2016 Pew Research Center survey found that nearly 80 percent of American workers were "very" or "somewhat" satisfied with their current job. Pew Research Center, "The State of American Jobs," October 6, 2016, https://www.pewsocialtrends.org/2016/10/06/3-how-americans-view-their-jobs/.

2. A 2017 Strada-Gallup poll found that 40 percent of bachelor's degree holders say they would have chosen a different major. By contrast, only 20 percent of STEM graduates say they would have chosen a different major. Strada Education Network and Gallup, "On Second Thought: U.S. Adults Reflect on Their Education Decisions," June 2017, https://www.sac.edu/research/PublishingImages/Pages/research-studies/Gallup-Strada%20Education%20Network%20June%202017%20Inaugural%20Report.pdf.

3. There are only 80 associate degree holders who formerly worked in STEM in the sample. Results should be interpreted with caution.

4. US Bureau of Labor Statistics, "Employment Projections: Employment in STEM Occupations," September 4, 2019, https://www.bls.gov/emp/tables/stem-employment.htm.

5. Anthony P. Carnevale, Nicole Smith, and Michelle Melton, *STEM: Executive Summary*, Georgetown University, Center on Education and the Workforce, November 2014, https://1gyhoq479ufd3yna29x7ubjn-wpengine.netdna-ssl.com/wp-content/uploads/2014/11/stem-execsum.pdf.

6. Nikki Graf, Richard Fry, and Gary Funk, "7 Facts About the STEM Workforce," Pew Research Center, January 9, 2018, https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/.

7. Stella Fayer, Alan Lacey, and Audrey Watson, "STEM Occupations: Past, Present, and Future," US Bureau of Labor Statistics, January 2017, https://www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf.

8. US Bureau of Labor Statistics, "Employment Projections." Even with a relatively high rate of growth, STEM jobs still make up less than 10 percent of the total workforce.

9. According to Deming and Noray, "applied STEM" majors refer to degrees such as engineering and computer science, while "pure" STEM majors include majors such as chemistry, biology, and mathematics. David J. Deming and Kadeem L. Noray, "STEM Careers and the Changing Skill Requirements of Work" (working paper, National Bureau of Economic Research, Cambridge, MA, June 2019), https://www.nber.org/papers/w25065.

10. Deming and Noray, "STEM Careers and the Changing Skill Requirements of Work."

11. David Deming, "In the Salary Race, Engineers Spring but English Majors Endure," *New York Times*, October 1, 2019, https://www.nytimes.com/2019/09/20/business/liberal-arts-stem-salaries.html.

12. For example, see David Autor and Anna Salomons, "Is Automation Labor-Displacing? Productivity Growth, Employment, and the Labor Ahare," Brookings Institution, March 2018, https://www.brookings.edu/wp-content/uploads/2018/03/1_autorsalomons.pdf; and David H. Autor, "Why Are There Still So Many Jobs? The History and Future of Workplace Automation," *Journal of Economic Perspectives* 29, no. 3 (Summer 2015): 3–30, https://economics.mit.edu/files/11563.

13. Centre for the New Economy and Society, *The Future of Jobs Report 2018*, World Economic Forum, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf.

14. Jacques Bughin et al., "Skill Shift: Automation and the Future of the Workforce," McKinsey Global Institute, May 2018, https://www.mckinsey.com/~/media/mckinsey/featured%20insights/future%20of%20organizations/skill%20shift%20automation%20and%20the%20future%20of%20the%20workforce/mgi-skill-shift-automation-and-future-of-the-workforce-may-2018.ashx.

15. David Deming, "The Growing Importance of Social Skills in the Labor Market" (working paper, National Bureau of Economic Research, Cambridge, MA, June 2017), https://www.nber.org/papers/w21473.pdf.

16. National Association of Colleges and Employersf, "Employers Want to See These Attributes on Students' Resumes," December 12, 2018, https://www.naceweb.org/talent-acquisition/candidate-selection/employers-want-to-see-these-attributes-on-students-resumes/.

17. Diane Whitmore Schanzenbach et al., *Seven Facts on Noncognitive Skills from Education to the Labor Market*, Hamilton Project, October 2016, https://www.hamiltonproject.org/assets/files/seven_facts_noncognitive_skills_education_labor_market.pdf.

18. Project Lead the Way, *The Power of Transportable Skills: Assessing the Demand and Value of the Skills of the Future*, Burning Glass Technologies, https://www.burning-glass.com/wp-content/uploads/ThePowerOfTransportableSkills.pdf.

19. Valerie Strauss, "The Surprising Thing Google Learned About Its Employees—and What It Means for Today's Students," *Washington Post*, December 20, 2017, https://www.washingtonpost.com/news/answer-sheet/wp/2017/12/20/the-surprising-thing-google-learned-about-its-employees-and-what-it-means-for-todays-students/.

20. US Department of Homeland Security, "STEM Designated Degree Program List," May 10, 2016, https://www.ice.gov/sites/default/files/documents/Document/2016/stem-list.pdf. It should be noted that our analysis, in keeping with this list, excluded some health care–related degrees from the list of STEM majors.

21. Giovanni Peri, Kevin Shih, and Chad Sparber, "STEM Workers, H-1B Visas, and Productivity in US Cities," *Journal of Labor Economics* 33, no. S1 (July 2015): S225–55, https://www.jstor.org/stable/10.1086/679061.

22. Deming and Noray, "STEM Careers and the Changing Skill Requirements of Work." The majority of the Deming and Noray analysis highlights applied STEM fields (such as math and engineering), as opposed to the broader STEM classification used in this report.

23. If respondents listed multiple STEM degrees in different fields (i.e., computer science and mechanical engineering), their degree group was based on the first degree they listed.

24. Respondents with master's degrees or more advanced degrees were asked if any of their degrees—bachelor's or graduate—are in STEM.

25. The survey asked respondents a series of questions about their employment status and experience working in STEM to identify current STEM workers, former STEM workers, and those who have never worked in STEM. Because we lacked detailed information about some respondents' specific occupation fields, we chose to use respondents' self-reported STEM employment classification to identify those groups. Therefore, the STEM workers in our study may have different occupations than those analyzed in other studies.

26. This analysis was conducted among STEM degree holders who had ever been employed.

27. This analysis is based on racial and ethnic categories because some individual racial and ethnic groups were too small to analyze separately. The three categories are (1) non-Hispanic white; (2) non-Hispanic Asian, Hawaiian, or Pacific Islander; and (3) all other racial and ethnic identities, including Hispanic, African American or black, American Indian or Alaska Native, and multiracial.

28. For example, see Cary Funk and Kim Parker, "Diversity in the STEM Workforce Varies Widely Across Jobs," Pew Research Center, January 9, 2018, https://www.pewsocialtrends.org/2018/01/09/diversity-in-the-stem-workforce-varies-widely-across-jobs/; and Ryan Noonan, "Women in STEM: 2017 Update," US Department of Commerce, Economics and Statistics Administration, Office of the Chief Economist, November 13, 2017, https://www.spglobal.com/_media/documents/women-in-stem-2017-update.pdf.

29. This analysis is based on two racial and ethnic categories because some individual racial and ethnic groups were too small to analyze separately. The two categories are (1) non-Hispanic white and (2) all other racial and ethnic identities, including non-Hispanic Asian, Hawaiian, or Pacific Islander; Hispanic; African American or black; American Indian or Alaska Native; and multiracial.

30. For example, in "STEM Careers and the Changing Skill Requirements of Work," Deming and Noray find that the percentage of "applied" science degree holders working in STEM jobs drops from 63 percent at age 24 to 48 percent at age 35, eventually flattening out near 40 percent among older workers. Among "pure" science degree holders, approximately 29 percent work in a STEM occupation at age 24, while only 21 percent work in STEM at age 35. This also flattens out near 20 percent in later years.

31. The predicted probability was computed from the logistic regression model by holding all other covariates at their means.

32. This analysis excludes former STEM workers who are age 65 or older because the vast majority (92 percent) of people in that group report they are retired.

33. There are only 82 nonwhite former STEM workers under age 65 in the sample. Results should be interpreted with caution.

34. There are only 80 associate degree holders who formerly worked in STEM. Results should be interpreted with caution.