

STEM²⁰²² REPORT



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Collective Efforts and Actions in STEM:

Implications of Emerging Data

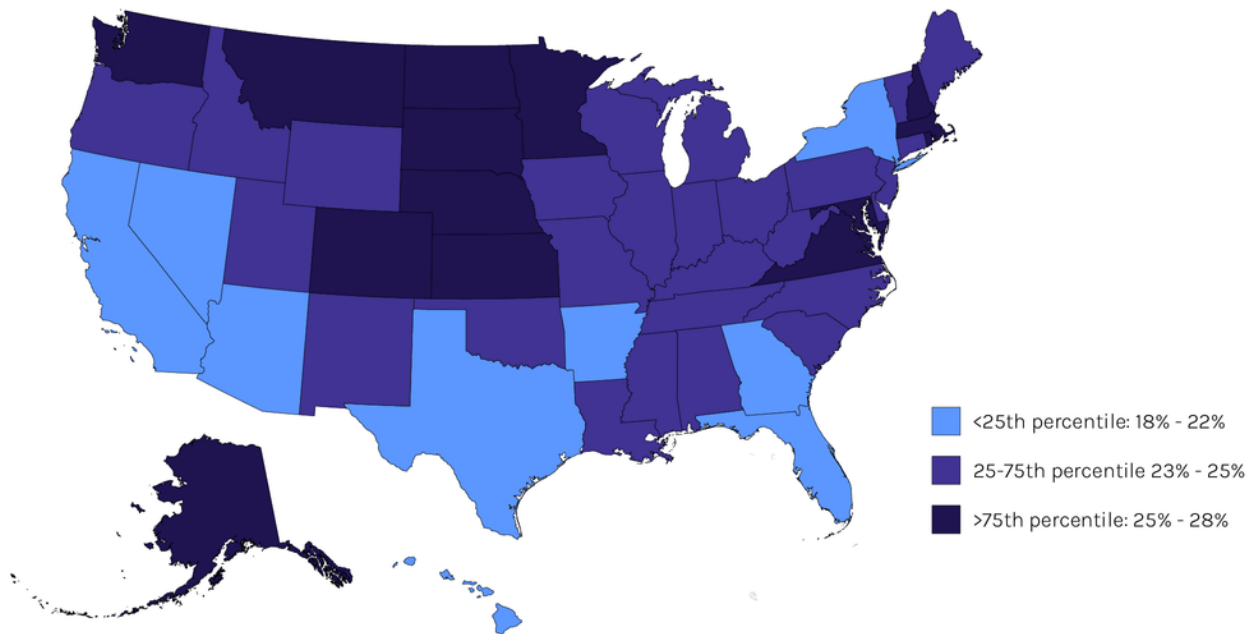


STEM EDUCATION & WORKFORCE IN COMMONWEALTH

The demand for STEM jobs is higher in Massachusetts than almost every other state. More than 40% of all employment in the Commonwealth revolves around innovation industries such as clean energy, information technology, and advanced manufacturing, thus the need for STEM graduates particularly impacts Massachusetts workforce development.

EMPLOYMENT IN STEM WORKFORCE

BY STATE: 2019



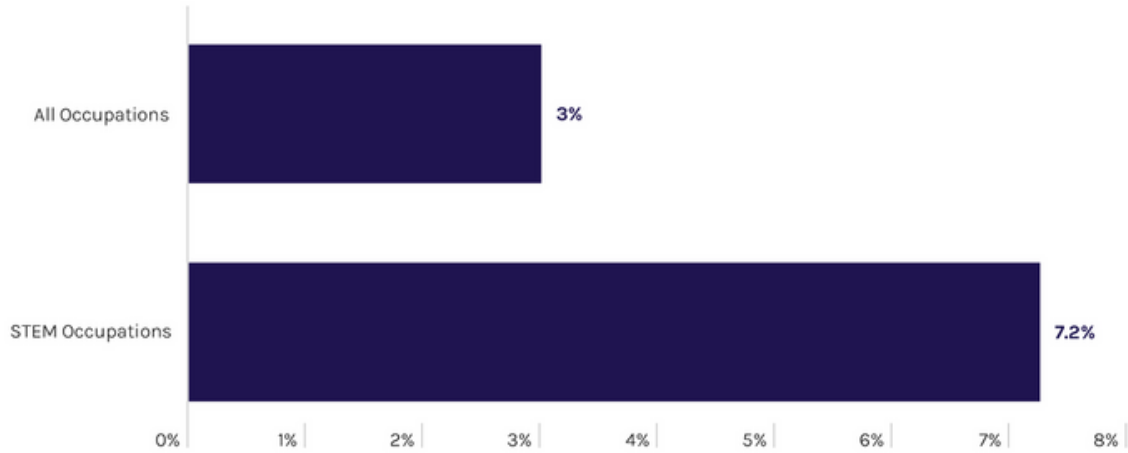
Stem = science, technology, engineering, and mathematics.

Note: Data include workers ages 16-75 and exclude those in military occupations or currently enrolled in primary or secondary school.

Sources: U.S. Census Bureau, American Community Survey (ACS), 2019, Public Use Microdata Sample (PUMS), data as of 25 October 2020.

STEM jobs are an important part of almost every industry in Massachusetts and consist of more than 100 occupations. STEM jobs are not limited to health care, science, computers, and engineering categories. In fact, business services, financial activities, and the wholesale/retail sectors employ more than 70,000 workers in STEM occupations. According to the STEM Brief 2021 published by CommCorp, the number of STEM jobs in Massachusetts is expected to increase by 7.2% by 2028, accounting for 40% of total expected employment growth. more than 20% of manufacturing jobs in Massachusetts have become STEM jobs.

MASSACHUSETTS GROWTH RATE OF JOBS: ALL OCCUPATIONS VS. STEM ONLY 2018-2028 PROJECTIONS



Source: Commonwealth Corporation analysis of Massachusetts Economic Research Department, Executive Office of Labor and Workforce Development Occupational Projections.

IMPACT OF COVID-19 ON STEM WORKFORCE: PROJECTED EMPLOYMENT GROWTH FOR FASTEST GROWING IN STEM

Since the pandemic began, workplaces have increased the adoption of remote and hybrid work arrangements, e-commerce has surged, and the availability of telemedicine and telehealth services has greatly expanded. These trends require enhanced the qualities and increased the needs of STEM field workers to leverage artificial intelligence, cybersecurity, and manufacturing to enable an effective workforce ecosystem. The table below shows the employment of STEM occupations with projected growth faster than the average for all occupations.

EMPLOYMENT IN STEM OCCUPATIONS, 2021 AND PROJECTED 2031 NUMBERS IN THOUSANDS

Occupation Category	Employment, 2021	Employment, 2031	Employment Change, 2021-31	Percent Employment Change, 2021-31	Median Annual Wage, 2021
Total, all occupations	158,134.7	166,452.1	8,317.4	5.3	\$45,760
STEM occupations	9,880.2	10,944.2	1,064.0	10.8	\$95,420
Non-STEM occupations	148,254.5	155,508.0	7,253.5	4.9	\$40,120

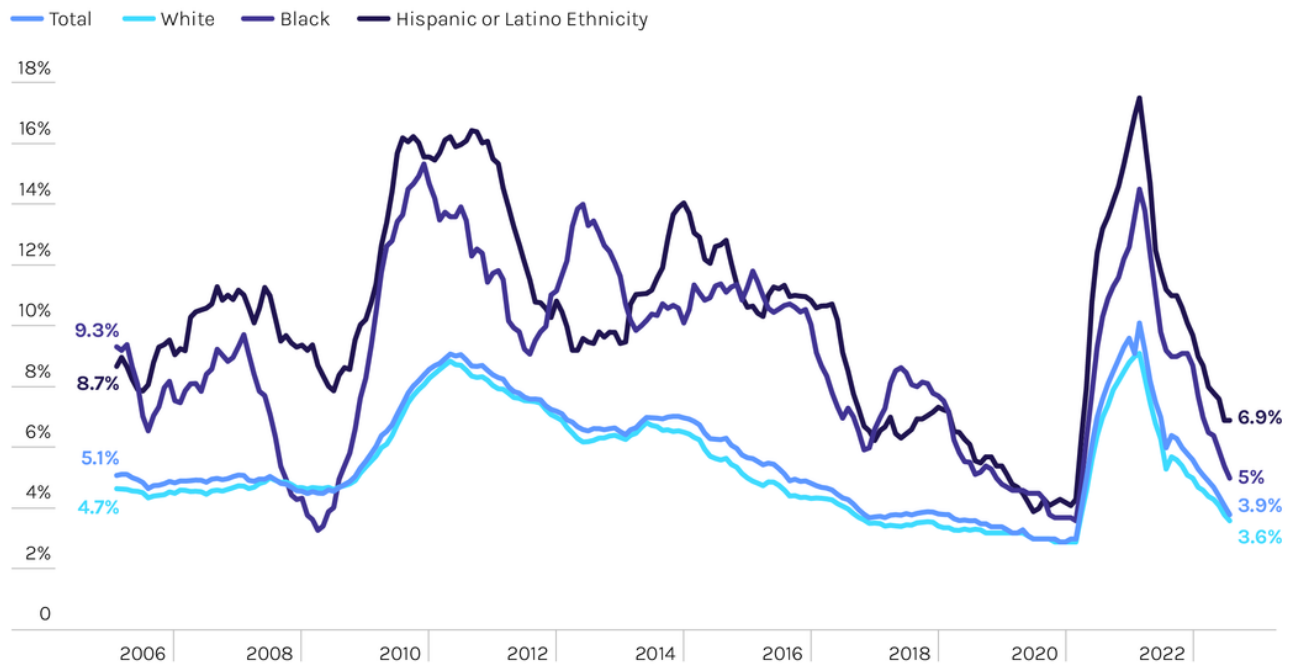
Data are from the Occupational Employment and Wage Statistics program, U.S. Bureau of Labor Statistics. Wage data cover non-farm wage and salary workers and do not cover the self-employed, owners and partners in unincorporated firms, or household workers.

TRENDS IN MINORITY AND FEMALE WORKFORCE PARTICIPATION DURING THE PANDEMIC

The pandemic has accelerated key trends affecting the composition of the workforce such that BIPOC workers are more at risk of needing to make occupational transitions to remain competitive in the workforce.

According to the Executive Office of Labor and Workforce Development's Department of Economic Research, the unemployment rates in Massachusetts are higher for BIPOC workers than for white workers. In March 2021, Latinx unemployment reached a peak of more than 16% and remains approximately twice as high as the white unemployment rate in January 2022.

MASSACHUSETTS UNEMPLOYMENT RATES BY RACE/ETHNICITY 12 MONTH MOVING AVERAGES

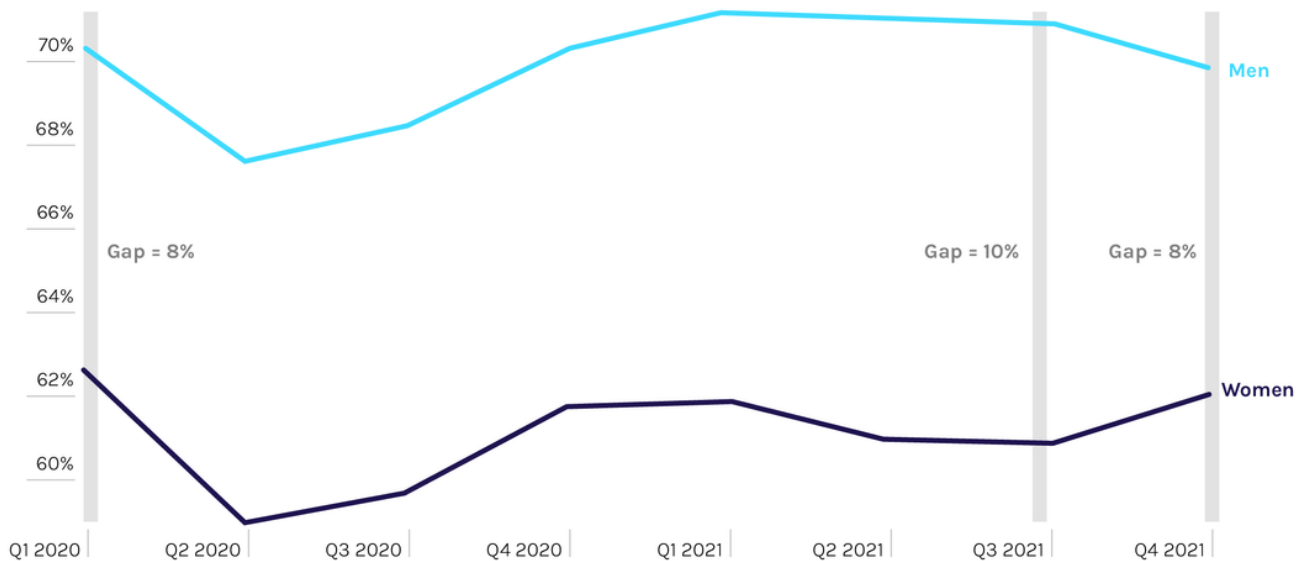


Source: Bureau of Labor Statistics (BLS), Current Population Survey (CPS), 12 Month Moving Averages, Compiled by MA Department of Economic Research (DER).



The pandemic has disproportionately affected female workers in Massachusetts. Due to child-care needs or remote-learning demands, many women left the workforce or contemplated downshifting their careers. The initial job loss in response to pandemic closures led to a dramatic decline in female employment. Specifically, according to a report, "The Impact of Covid-19 on Women in Workforce" published by the Executive Office of Labor and Workforce Development in October, 2021, female claimants on unemployment benefits increased sharply during the pandemic. Throughout the recovery, the employment rate among female workers remains lower than that of male workers.

ESTIMATED LABOR FORCE PARTICIPATION RATES FOR MEN AND WOMEN NOT SEASONALLY ADJUSTED



Note: Labor force participation rates (LFPR) for each group are developed by applying the ratio of LFPRs between each group and the total population using 6 months of Basic Monthly Current Population Survey data to the official quarterly statewide LFPR published by the Bureau of Labor Statistics. Estimates should be interpreted with caution. Based on methodology developed by the Economic Policy Institute.

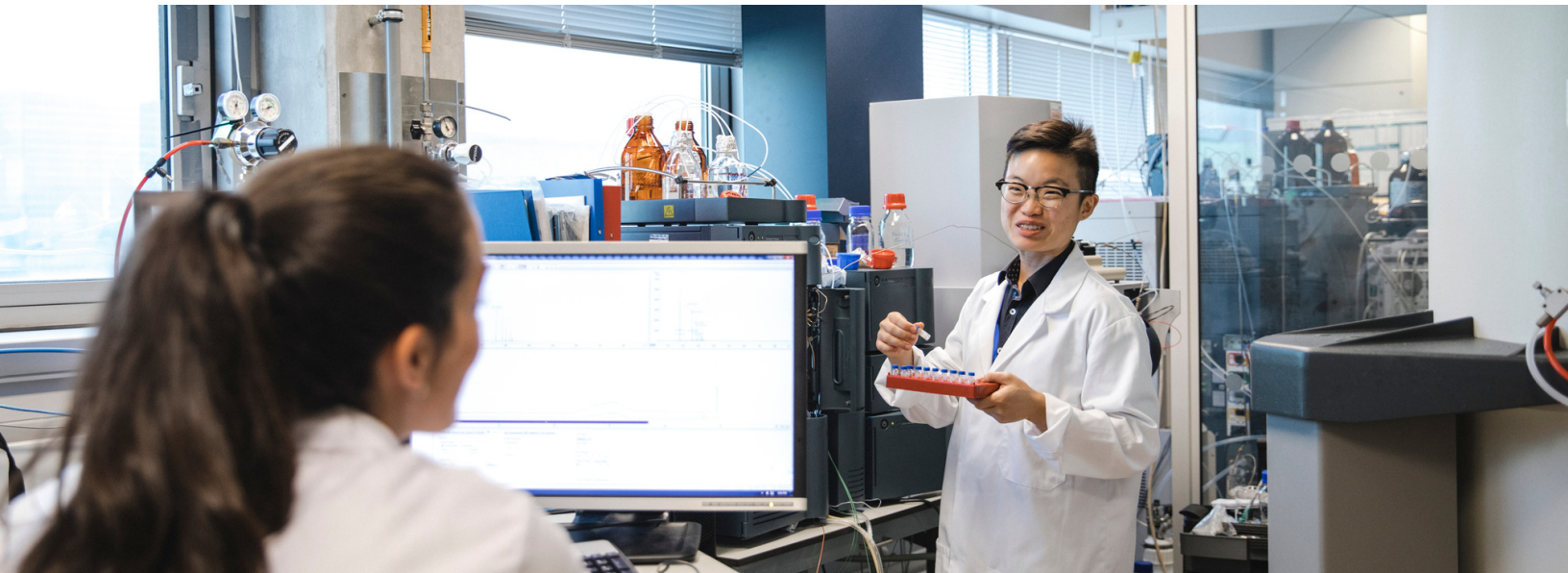
Source: Bureau of Labor Statistics.

Inclusive STEM Ecosystems for Equity & Diversity



DIVERSE STEM WORKFORCE

In Massachusetts, 21% of the Commonwealth's total workforce is employed by a STEM industry, significantly higher than the nation's average of 14%. According to the U.S. Bureau of Labor Statistics data analysis, the number of STEM occupations is expected to increase by 10.8% by 2031. Despite a broad consensus in the STEM field that having more workers in the workforce leads to better outcomes and solutions, building authentic diversity in the industry is remains a challenge for the workforce ecosystem.



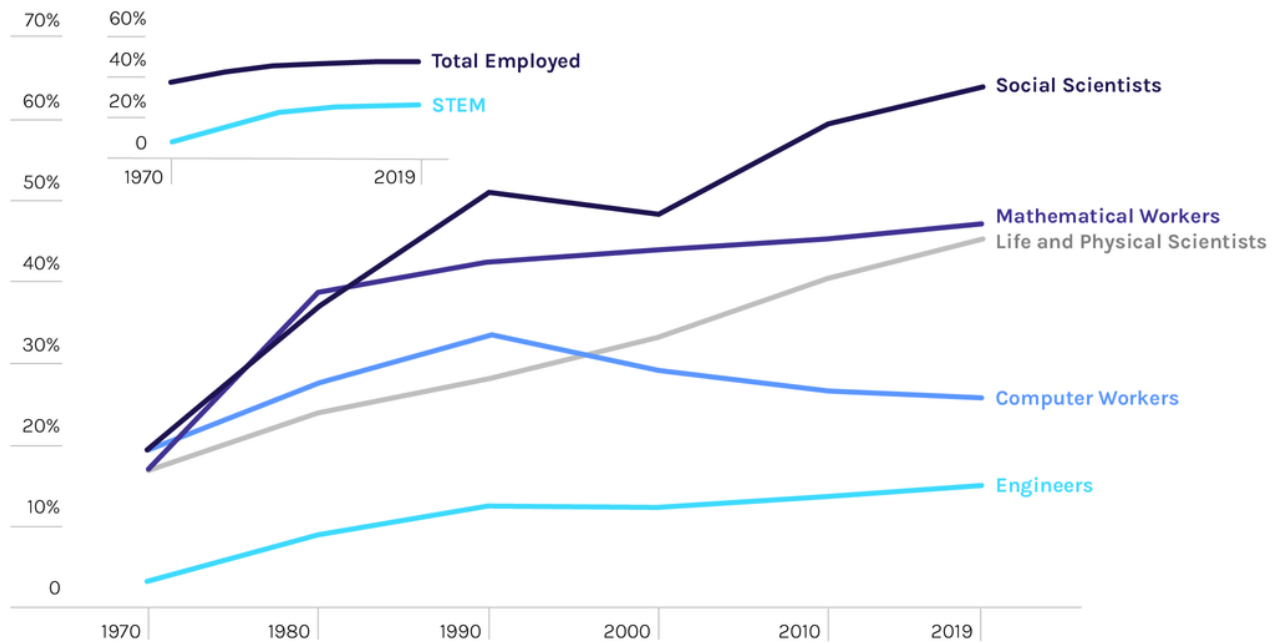
WORKFORCE DIVERSITY: A KEY TO IMPROVING ENGAGEMENT AND PRODUCTIVITY

Studies have shown that diversity in workplaces, particularly the STEM workforce, improves work performance and engagement, enhances the quality of research and provision of health care, and promotes innovation and growth. Specifically, diversity not only expands the available talent pool, but also increases the range of perspectives and expertise available to solve grand challenges in STEM.

WOMEN IN STEM

Since 1970, the representation of women has increased across all STEM occupations. Women have made significant gains in social science fields in particular – from 19% in 1970 to 64% in 2019. However, they did not make as big gains in computer and engineering occupations, which comprised the largest portion (80%) of the STEM workforce.

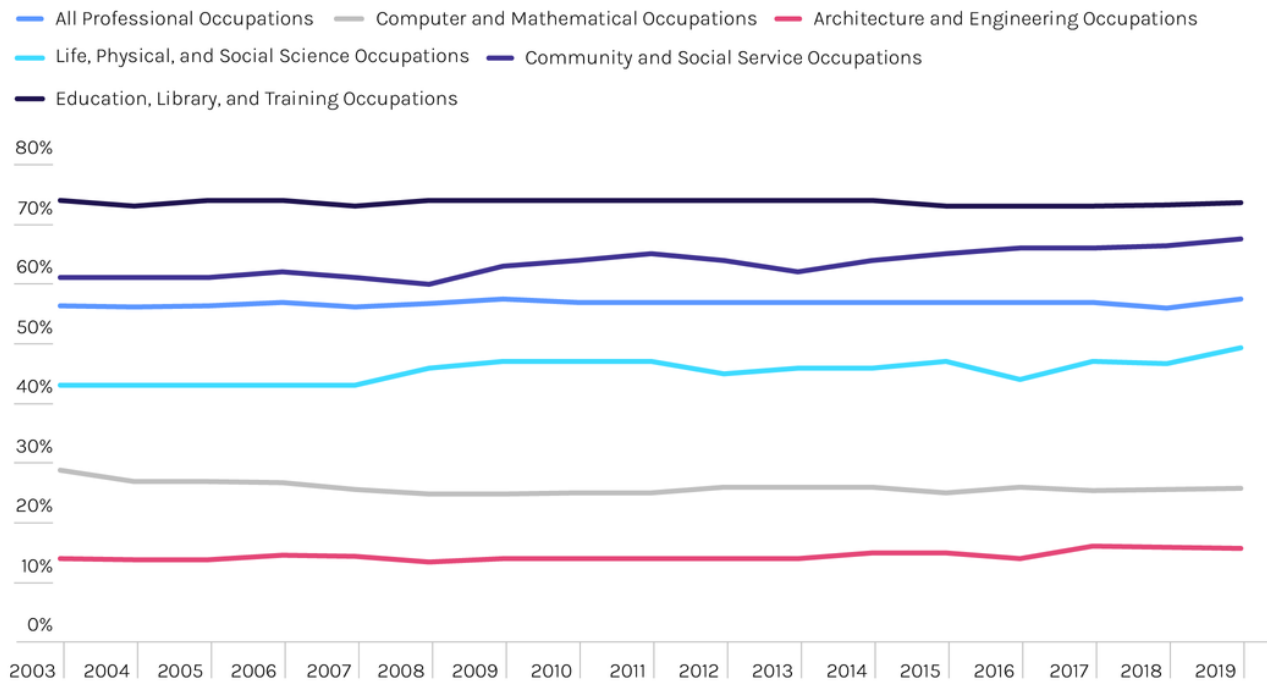
PERCENTAGE OF WOMEN IN STEM JOBS 1970 - 2019



Source: U.S. Census Bureau, 1970, 1980, 1990 and 2000 Censuses; 2010 and 2019 American Community Surveys, 1-Year Estimates.

A recent report from the Equal Employment Opportunity Commission shows that the gender gap in STEM starts as early as high school and remains in higher education. Racial and ethnic disparities that extend beyond the STEM field also start early in the education pipeline. Massachusetts shares the same challenges as the private sector in improving the representation of women in STEM occupations. The STEM jobs in Massachusetts are employed by 49% women and 51% men. However, the four leading STEM industry sectors and higher-paying job sectors, have bigger gender imbalances.

Percent Women Employment in Select Professional Occupational Categories (2003-2019)



To decrease the gender imbalance in the STEM workforce and encourage more young girls into STEM fields, the Commonwealth has continued to expand the pathway and provide more opportunities for them to pursue STEM-focused careers:

Expanded career and college pathways for young people to pursue industry-recognized credentials

Worked across public and private sectors to strengthen students' foundational skills

Deepened partnerships with employers and higher-education institutions to offer more work-based learning experiences

Engaged businesses stepped up to offer internships in STEM fields

State of STEM in Massachusetts:

Develop the Landscape of High-Impact Pathways for the Future Workforce



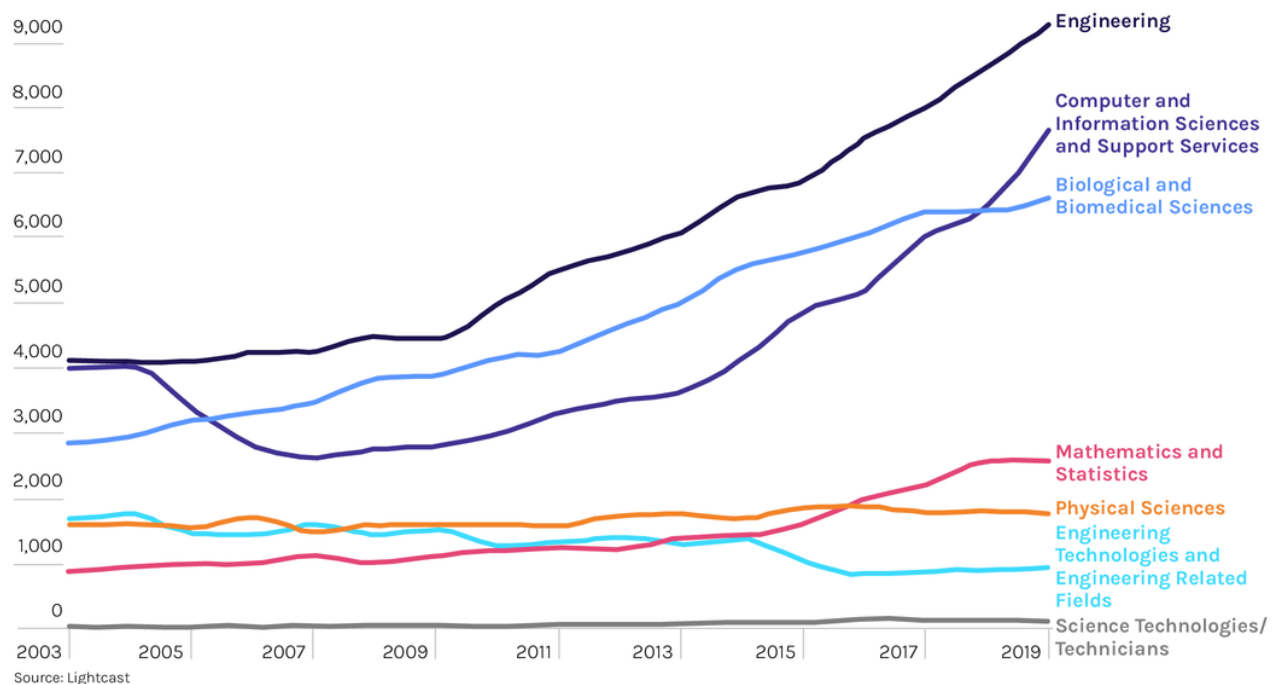
ADDRESS THE STEM TALENT GAPS

Making high-quality STEM education accessible to all Americans, particularly to underrepresented and underserved groups, is a critical element of increasing equity and inclusion in workforce development. According to the 2021 Progress Report by the Office of Science and Technology on the Implementation of the STEM Education Strategic Plan, it's a priority for educators and employers to close the labor gap by expanding the pathways in STEM education and to maximize the creative capacity of future workforce by increasing upskill training.

Massachusetts is well-positioned to meet its technical workforce needs given its national leadership in STEM talent. However, without adequately expanding opportunities for training and certification in the disciplines that produce STEM talent, it would impact the availability and quality of the STEM workforce ecosystem. Several industry-ready credentials and stronger partnerships between employers and educational institutions have been developed in the state to support workforce development strategies that augment the technical talent pipeline.

MASSACHUSETTS TECHNICAL EDUCATION PIPELINE

DEGREE TREND BY EDUCATION TRACK



BUILD A STRONG WORKFORCE PIPELINE

Workforce Competitiveness Trust Fund (WCTF) Program

The WCTF invests in demand-driven programs designed by industry sector partnerships, including STEM fields that train and place unemployed and underemployed workers. The WCTF model enables community organizations to build and sustain effective partnerships with employer partners and the public workforce system while striving to incorporate more equitable and innovative practices that lead to increased economic mobility and workforce pipeline for more people in the Commonwealth.

Through the end of FY22, over 3,100 unemployed and underemployed adults have enrolled in career pathways programs in priority occupations and industries in the workforce region. The regional partnerships include training providers, MassHire Workforce Boards and Career Centers, community-based organizations, and local employers. In addition to the 3,100 enrolled to date, active partnerships have plans to enroll an additional 1,700 over the next year or two.



For grants active through FY22, 65% of participants are women, over 70% are BIPOC and/or Latinx, 20% are aged 45 years or older, 38% are immigrants, 31% do not have English as their first language, over 85% are low-income, on public assistance and/or current or former UI claimants. Three-quarters of participants have less than an Associate's degree as their highest level of education. Over the eight years, including partnership grants that have ended or are still active, 90% of participants have successfully completed the training program. For programs ending before FY22, 82% of program completers entered employment. For programs not yet closed out as of FY22, over three-quarters (76%) of program completers have already found and retained employment at an average hourly wage of \$19.40.

Skill Capital Grant and Career Technical Initiative Programs

Skills Capital grants and Career Technical Initiative grants are awarded by Governor Baker's Workforce Skills Cabinet, which was created in 2015 to bring together the Secretariats of Education, Labor, and Workforce Development, and Housing and Economic Development to align education, economic development, and workforce policies to strategize around how to meet employers' demand for skilled workers in every region of the Commonwealth.

The Skills Capital Grant Program has become a crucial component of local workforce training efforts by expanding the number of young people and adults trained and experienced with the newest technologies used by local employers. Approximately 40,000 students across the Commonwealth have directly benefited from these grants, and 491 grants totaling approximately \$153 million have been awarded to 194 schools and educational institutions across MA.

The Baker-Polito Administration has also launched two programs in 2017 to help students develop knowledge and skills related to a chosen field of study before they graduate high school-- Early College and Innovation Pathways.

Early college programs combine traditional high school courses with an opportunity to earn college credit at a college or university. Currently, there are approximately 5,400 students enrolled in early college courses at 50 high schools across the Commonwealth, and the Executive Office of Education anticipates that approximately 8,700 students will be enrolled in early college programs by the 2024-2025 school year.

Innovation Pathways are early career programs that provide high school students with a coherent course of study focused on a particular field, while also offering them access to college-level courses and internship opportunities to gain work experience. Many of the early career programs are in STEM-related fields, including advanced manufacturing, information technology, environmental and life sciences, health care and social assistance, and business and finance. To date, 60 high schools across the Commonwealth have designated Innovation Pathways, totaling 150 different programs. Innovation Pathways differ from its sister program - Early College - in that students focus on a specific industry sector, with greater emphasis on career exploration, technical courses, work-based learning experiences, and industry-recognized credentials, rather than college credit courses and college planning.

Shape the Future of Work:

Massachusetts STEM Learning Ecosystem



COMPUTATIONAL THINKING AND THE FUTURE OF WORK: BE EMPOWERED FOR THE ARTIFICIAL INTELLIGENCE AGE

In a 2022 final report by the Future of Work Commission, which included 17 Massachusetts legislators, business, and labor leaders, indicates that the state has an emerging need to develop stackable pathways across education levels and expand the workforce training for reskilling and upskilling.

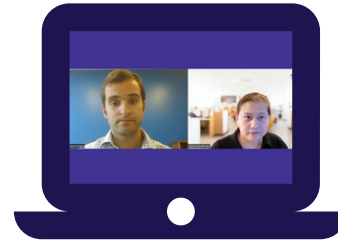
Additionally, it suggests that Massachusetts needs to increase its efforts in creating new “regional clusters” of excellence in STEM industries, such as Cybersecurity, Artificial Intelligence, Robotics, Advanced Manufacturing, and FinTech. By creating cluster-based collaboration, it will not only expand on these emerging technology sectors, but it will also place a much-needed emphasis on creating technology jobs in new regions that need to be bridged the digital divide and promote digital equity.

According to the Massachusetts Technology Leadership Council, only 5% of workers are Black, 7% are Latinx, and one-third are women in the Massachusetts technology sector, which includes the cybersecurity industry. Due to its widely recognized power for enhancing participation in a career field, mentorship can help develop a more inclusive cyber workforce by preparing diverse talent, especially college students, to pursue careers in cybersecurity.





Watch Interview



Cybersecurity Mentorship Program

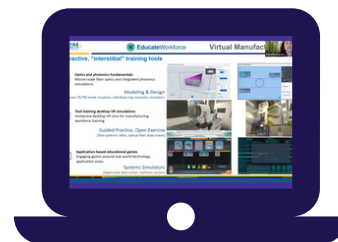
The goal of the Cybersecurity Mentorship Program is to encourage diverse undergraduate college students to continue to pursue a career in cybersecurity and promote the diversity of the cybersecurity workforce in Massachusetts. Forty-one (41) new students were accepted into the program, bringing the total number of students supported through the four cycles of the program to 101 for Spring 2022.

- 26,517+ Technical cyber security jobs in Massachusetts
- 19,994+ Cybersecurity job openings in Massachusetts over the past 12 months
- 385 Companies in Massachusetts focused on cybersecurity products and services
- 43 Cybersecurity degree programs across 27 colleges and universities in Massachusetts
- 6 National Security Agency Centers of Academic Excellence (CAE) schools in Massachusetts
- 3 Scholarship for Service (SFS) programs in Massachusetts



MIT
Lab for Education and
Application Prototypes
(LEAP) MA Network

Watch Interview



Advanced Manufacturing Program

The national manufacturing institute AIM Photonics and the Massachusetts Manufacturing Innovation Initiative, a state grant program managed by the MassTech Collaborative, have started to build a lab network, the Lab for Education and Application Prototypes (LEAP), across Massachusetts since 2015. The LEAP aims to accomplish four main tasks – teach integrated photonics manufacturing practice; provide small and medium enterprise (SME) technician training and certification; encourage startup and SME engagement in tools, process, and application upgrades; and support AIM Photonics multi-project wafer and Test, Assembly, and Packaging hubs. Since its origins at MIT, the LEAP network has expanded to comprise five integrated photonics-based labs in Massachusetts in 2022, creating a geographically distributed network focused on STEM education, workforce development, and industry/academic collaboration. The LEAP network strives to build interest and engagement in STEM education workforce training for the current and next generations.

What's Next?

Now is the Time for us
to Take Action!



Call for Action

This report provides an overview of understanding the current structures, needs, implementation strategies, and impact on STEM education and workforce development. With a data-driven and evidence-based approach, we are able to identify the trends of STEM job needs, compare the impact of the pandemic on STEM workforce equity, and recognize the importance of diverse pipelines to enhance engagement and enable the STEM workforce ecosystem.

With all the available resources and the support of the STEM community of practice, now it is the time for us to take action on unifying and strengthening the efforts to expand a robust STEM pipeline and develop the landscape of high-impact pathways for educational programs and the future of the workforce. Specifically, how diversifying our STEM pipeline and enhancing workforce equity would be the critical priorities to effectively enable our STEM learning ecosystem in Massachusetts. By developing non-traditional STEM learning pathways from youth to adult training for the BIPOC population, it will leverage the power of innovation and the education and training of in-demand skills for the future STEM workforce.

Achieving this vision requires the support of the governance administration, collaboration of educational institutions, innovative partnerships with local STEM organizations, and community outreach. We are continuing this effort that leads to not only innovation but also to a diverse, equitable, and inclusive STEM ecosystem.





**We thank you for your
continued support.**

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