ILLINOIS INNOVATION INDEX

2022 STEM Talent Index

Assessing a Decade of Pipeline Development

Powered by ILLINOIS SCIENCE & TECHNOLOGY COALITION USG

INTRODUCTION

This year's edition of the STEM Talent Index looks back at Illinois' progress within the state's science, technology, engineering, and mathematics (STEM) talent pipeline from 2012 through 2021. Examining both degree completion and the job market, findings are mixed. Illinois is one of the fastest-growing states in the top 10 for STEM degree production, although degree production has slowed slightly due to the COVID-19 pandemic. And while degree production is trending upward overall, the job market has suffered a slight decline. Though it is expected that STEM job numbers will be more robust next year, STEM fields were harder hit than their non-STEM counterparts by pandemic-related layoffs.

Driven by advancements in technology and an evolving job market, STEM degree fields have grown steadily since 2012. In 2021, Illinois awarded 27,285 bachelor's, master's, and doctoral degrees in STEM areas, a record high for the state. Illinois experienced a 8% year-over-year increase between 2020 and 2021 in the number of STEM degrees completed by students in Illinois, placing the state 5th during that time period. Illinois is now the fastest-growing state in the top 10 for STEM degree production when looking at the one-year trend from 2020-2021. Perhaps most importantly, data from the National Science Foundation shows that 39% of STEM graduates in 2021 from Illinois universities were women. This is the highest composition of STEM graduates that were women in Illinois history, and puts Illinois considerably ahead of the national average of 34% for this metric.

As Illinois continues to increase its STEM degree production, there continues to be significant growth in computer and information sciences, and interdisciplinary STEM fields. However, while computer and information sciences have been one of the fastest-growing STEM subject areas in Illinois for the last 10 years, it slid to 7th place nationally, a big drop from the 3rd place ranking it held in 2019. This change is due to states that had a similar number of computer science degrees in 2019 increasing at a faster rate than Illinois. An estimated 62% of Illinois Computer and Information Science graduates remain in the state to start their careers according to data acquired from LinkedIn.

While Illinois hit a new record with the number of degrees awarded in 2021, the job market took a slight turn from the increases it experienced in 2019. Between 2020 and 2021, the number of STEM positions filled by workers dropped by just under 15,000, a 2% decrease year-over-year. Although Illinois is still ranked 7th overall in the nation for the share of its workforce involved in STEM trades, its annualized growth over the previous five-year period is -1% due to the disproportionate impact of the pandemic.

While Women, Black, and Latino Illinoisans remain underrepresented in both STEM degrees awarded and employment in STEM jobs, there are positive takeaways as well and this story appears to be changing. This year's report does show that Illinois' Latino population has made considerable gains over the past decade. In 2010, Latino individuals made up 6% of STEM employees in Illinois, but now Latino Illinoisans represent 10% of that total. Additionally, more women are receiving STEM degrees and starting careers in the field than ever before. Lasting inequities do, however, still remain. Many women have found it difficult to get a career started in Illinois within these fields, as is indicated by the stagnating composition of women in the STEM workforce, a figure that has hovered around 25% for the last decade. Unfortunately, there has also been a decrease over the past decade for Black Illinoisans in both degree completions and in employment as a percentage of the total STEM workforce, a change that has been particularly pronounced over the last year. In 2019, 6% of STEM Degree Earners and around 7% of the STEM workforce were black. These fell to 4% and 6%, respectively, in 2021. This year's Talent Index shows that there is still more work to be done to ensure all Illinoisans have access to opportunities within Science, Technology, Engineering, and Mathematics.

- See Index Methodology here

KEY FINDINGS

STEM TALENT SUPPLY

- **In 2021, Illinois awarded 27,285 bachelor's, master's, and doctoral degrees in STEM**—a new milestone for the state. Illinois now ranks as the seventh most active state in STEM degree production.
- While progress has been made, the **10-year Cumulative Average Growth Rate in Illinois is 5.4% which is slower than the national growth rate of 4.8% annually** over the same period.
- **Illinois now ranks fifth in growth from** 2020 to 2021 in the number of STEM degrees completed, with a year-over-year increase of 8% between 2020 and 2021 in the number of STEM degrees completed by students in Illinois.
- As it relates to STEM subject areas, a record number of Computer and Information Science degrees (5,822) were conferred by Illinois universities. **The fastest-growing Illinois STEM subject areas over the last 10 years are Business Management (15%), Computer and Information Sciences (10%), and Interdisciplinary Studies (9%).**

STEM TALENT DEMAND

- 326,810 STEM positions were filled in Illinois in 2021, **a 6-year low**.
- For 2021, in Illinois, the number **of STEM positions filled by workers dropped by just under 15,000,** a reversal of the growth trend seen in the 2020 STEM Talent Index.
- Approximately **6% of jobs in Illinois are STEM-related,** according to the most recent data from the Bureau of Labor Statistics. This places the state 7th overall in the nation.
- Over the past decade, **employers added 68,440 new STEM jobs** to the Illinois economy.
- **Computer science is still the leading STEM job sector in the state.** In 2021, it reached 163,120. This is a slight decline from 2020 when there were 174,450 jobs. Even with the decrease, computer-related jobs in Illinois rank 7th nationally.
- **The state's fastest-growing STEM occupations include mathematicians, business statistics roles like actuarial scientists, and professors in social sciences.** The significant growth in the math and management fields is possibly due to data coding changes.

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DIVERSITY, EQUITY, AND INCLUSION IN STEM

- **In 2021, 10,648 STEM degrees in Illinois were awarded to women.** This is the highest share (39%) of STEM degree completions for women in the history of our collection.
- Of the 27,285 STEM degrees awarded in Illinois in 2021, just 1,203 were awarded to Black students. The share of STEM degrees awarded to Black students in Illinois has fallen since 2012 when 5% of STEM degrees were awarded to Black students. In 2021, just 4% of STEM degrees awarded in Illinois were conferred to Black students. **Black professionals in Illinois make up just 6% of STEM jobs.**
- Illinois' Latino populations continue to make strides in STEM in terms of degree completion and total share of STEM jobs. **In 2021, 9% of all STEM degree recipients were Latino students, reflecting a near doubling in the composition of STEM degree recipients in Illinois from a Hispanic background since 2012.** Latino professionals make up 9% of STEM jobs in Illinois with a record total of 49,160 in 2021.

COMPUTER AND DATA SCIENCE IN-DEPTH

- **Computer and Information Sciences is one of the fastest-growing degree areas for Illinois students.** Since 2012, the number of degrees awarded in the field has increased by an average of 10% annually.
- **Illinois is a top producer of Computer and Data Science graduates regionally.**
- Recent Illinois graduates with a degree in Data Science or Computer Science totaled 35,383, and of those graduates, **21,944 have remained in Illinois after graduation.**
- Top cities for Illinois graduates to migrate to after graduation include San Francisco, New York City, Seattle, and Los Angeles.

BIOMEDICAL & BIOTECHNOLOGY TALENT

- In 2021, Illinois awarded 4,744 degrees in 'the biomedical' and 'biotechnology' fields according to data from LinkedIn (coding included in methodology).
- **Since 2012, more degrees have been awarded to students focusing on biological sciences, degrees awarded in biological sciences in Illinois** have increased by 1% annually since 2012 while the U.S. sits at 2% growth on this measure.
- Recent Illinois graduates working in biomedical and biotechnology jobs in the state totaled 11,019 in 2021.
- An estimated 74% of recent graduates in Illinois with Biomedical or Biotechnology degrees **have stayed in Illinois to start their careers.**

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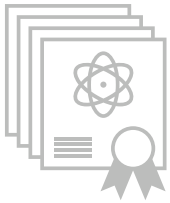
STEM TALENT SUPPLY

Driven by advancements in technology and an evolving job market, STEM degree fields in Illinois have grown steadily over the past decade. Growth in the computer and information sciences area remains strong, with significant growth seen in the interdisciplinary studies and business management subject areas. Over the past 10 years, Illinois has solidified its reputation as a leader in STEM education, increasing the number of degrees awarded year over year and the number of STEM degree offerings. Increases in STEM degree completions by Illinois students have occurred at the same time enrollment declines have challenged smaller universities in the state. While enrollment challenges present a potential problem in the future, each of the state's R1 universities saw incoming freshman classes rise in this new academic year of 2022-2023. While the state continues to make incredible strides in its STEM education, over the past decade, diversity, equity, and inclusion progress has remained stagnant among traditionally underrepresented groups in STEM, especially for Black Illinois residents and women seeking careers within these fields.

Illinois remains a top STEM degree producer

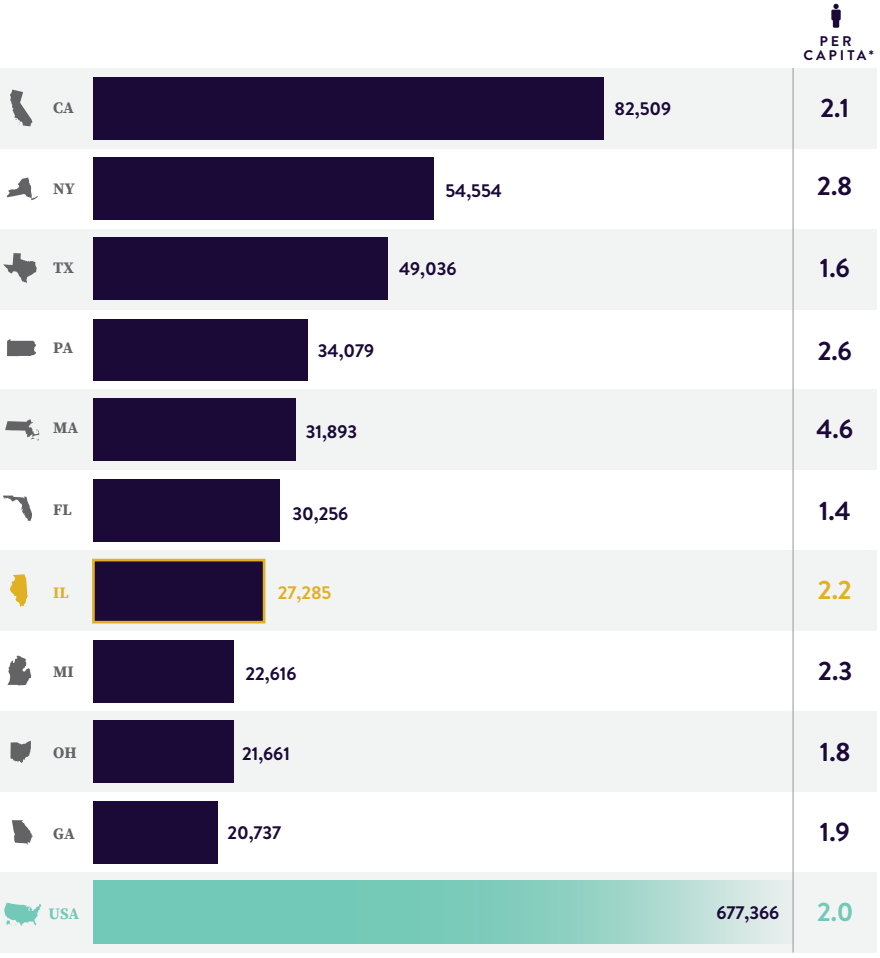
In 2021, Illinois awarded 27,285 bachelor's, master's, and doctoral degrees in STEM areas—a new milestone for the state. Since 2012, STEM degrees awarded in Illinois have grown by 5% annually, considerably outpacing



STEM Degrees by State

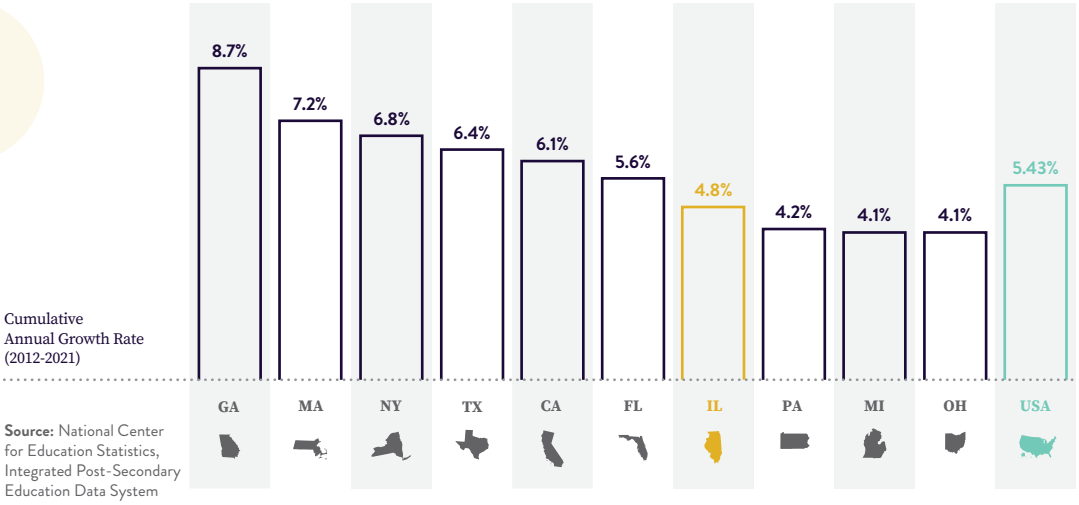
Top 10 States

2021



*PER 1,000 RESIDENTS

non-STEM degree growth of .2%. Although STEM degree growth exceeds non-STEM degrees, growth of STEM degrees in Illinois has trailed the national trend of 5% annual growth over the past decade. Illinois currently ranks 7th nationally in STEM degrees awarded, the same spot it held in 2020. Conversely, Illinois is now one of the fastest-growing states in the Top 10 for STEM degree production. Between 2020 and 2021, the state saw a 8% year-over-year increase in the number of STEM degrees completed by students in Illinois, ranking 5th in growth from 2020 to 2021. The four states that ranked above Illinois were New Hampshire, Utah, North Carolina, and Maryland.



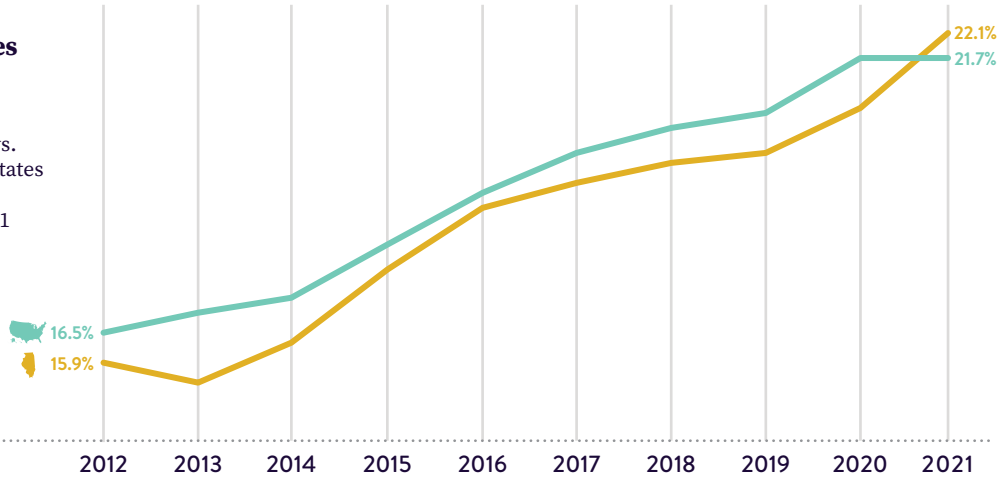
Source: National Center for Education Statistics, Integrated Post-Secondary Education Data System

STEM degrees have made up an increasingly large share of all degrees conferred in Illinois since 2013. In 2021, of the 123,670 degrees awarded in Illinois, 22% were STEM related, compared to the national rate of 22%. STEM degrees have made up an increasing share of all degrees consistently since 2010—a nearly 7% point increase on this metric since 2010 in Illinois and a 6% point increase on this metric since 2012 nationally.

STEM Degrees Share

Illinois vs. United States

2012-2021



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System

▲ *DPI Released a 2022 Report on Upskilling and Apprenticeship Revealing important trends in the Chicago STEM Talent Pipeline*

COMMUNITY HIGHLIGHTS

DISCOVERY PARTNERS INSTITUTE

DPI REPORT SHOWS THE IMPORTANCE OF APPRENTICESHIPS IN MEETING THE TALENT DEMANDS OF THE 21ST CENTURY STEM ECONOMY

Illinois is the third-largest source for Computer Science talent in the nation. In 2021, 3,573 Computer Science graduates emerged from schools in Illinois. Over the last decade the number of Computer Science graduates in Illinois has increased by an average of 9% annually. Post-pandemic, Illinois is the midwest's premier hub for software engineering, UX, and information technology talent. Discovery Partners Institute (DPI), part of the University of Illinois system, recently published a report noting ways to expand pathways to those with a non-traditional education experience. One promising pathway: apprenticeships.

DPI's 'Working Toward Change' report notes the returns that businesses can generate through the use of apprenticeships and cited statistics from a 2019 Consumer Technology Association data deepdive. That report noted that for every $1 of investment into an apprenticeship style program they can expect $1.50 in return.

However, these kinds of interventions remain underutilized in the STEM sector, making high-paying roles for software engineers, and other types of programmers, inaccessible for many individuals. DPI specifically notes the impact that high burdens on entry have on women of color seeking a career in STEM.

Computer and software design requires highly skilled individuals, and day-to-day learning often occurs organically through teamwork. Talent for these roles in Illinois could be increased by facilitating a dialogue about where these apprenticeship programs within computer science, software engineering, and IT could be most impactful. DPI reported on a number of different success stories in Chicago where apprenticeship programs have a real impact on diversifying and broadening the pool of

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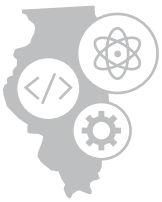
tech talent. New apprenticeship programs around Chicago include Cognizant's Full Stack Development Apprenticeship and Chicago/Skills programs, i.c.stars, Code Platoon for Veterans and Active Duty Service Members, Year Up, and many more. Cognizant's apprenticeship requires no prior experience and was developed in partnership with the City Colleges of Chicago and DPI.

Business management, interdisciplinary studies among top areas

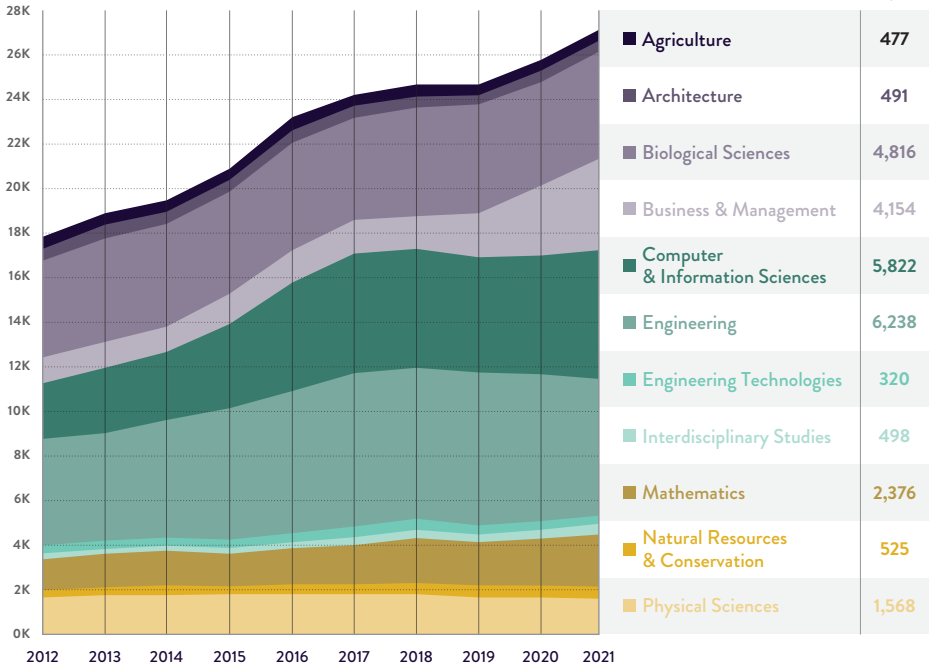
By subject area, STEM degrees awarded in Illinois are led by engineering (6,238), computer and information sciences (5,218), and biological sciences (4,714). Over the last 10 years, business management is the fastest-growing STEM subject area in Illinois, with a 15% growth rate. STEM degrees in Business Management include coursework in actuarial sciences, business and data analytics, and management sciences. This is followed by computer and information sciences—which includes computer science and other computer-related degrees—which is the second fastest-growing STEM subject in the state, growing by 10% annually since 2012. Interdisciplinary studies continue to see rapid growth with an increase of 9%. Mathematics has also seen an increase of 6% year over year since 2012. It should be noted that the increase among business management and interdisciplinary studies could be due to coding changes by the National Center for Education Statistics.

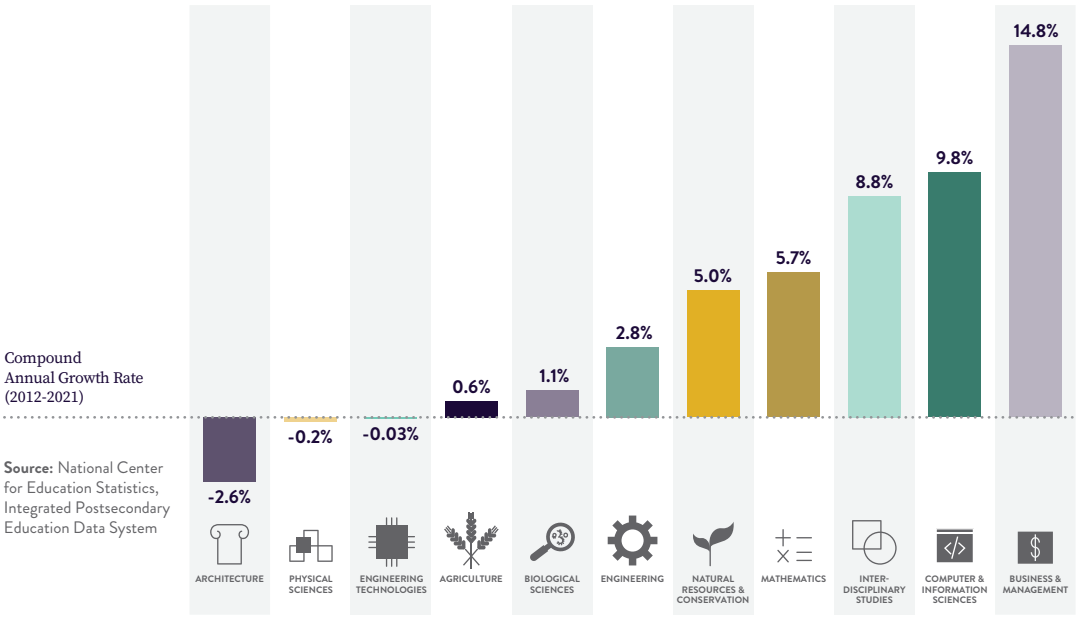


STEM Degrees by Subject Area

Illinois

2012-2021





Source: National Center for Education Statistics, Integrated Postsecondary Education Data System

When compared to national averages in these subject areas, Illinois is behind in biology degree composition (4% vs. the national average of 5%) and engineering degree composition (5% vs. the national average of 6%. It is, however, ahead in mathematics (2% vs. 1%) and computer science (5% vs. 4%).

Since 2012, Illinois has also seen a decline in STEM degrees awarded in architecture (-3% annually), physical sciences (-.1%), and engineering technologies (-.1%). These subject areas are also the slowest growing nationally.

Illinois reaches record STEM degree production

Illinois conferred a record number of STEM degrees in 2021, awarding a little less than 2,000 more STEM degrees than in 2020. We follow the NSF's definition of STEM as closely as possible when breaking these degrees down by field and include only Bachelors degrees and higher for this section. Overall degree production slowed slightly with the onset of the pandemic, continuing a trend that began after 2018. This trend is true for all degrees awarded in Illinois, STEM and non-STEM. Illinois has yet to return to its record total of 126,228 degrees awarded in 2018, compared to 123,670 awarded overall in 2021—a decline of more than 2,500 degrees.

The improvements to STEM degree production highlight a comeback year in 2021 for Illinois universities returning to in-person learning as the pandemic slows. A number of degree areas had a record-breaking year. Computer and information sciences (5,822), business management (4,154), and Math (2,376) conferred their highest number of degrees ever in 2021. Business management degrees are only coded as STEM if their

coursework includes database management, actuarial sciences, and/or business statistics. Other subjects also saw almost record highs, including interdisciplinary studies (498) and biological sciences (4,816).

The skills these graduates learn in these programs help them as they enter the Illinois STEM job market. Moreover, when STEM graduates from Illinois migrate to other states it prepares them for their intended job fields and proves the quality of Illinois' STEM degree programs.

Community College trends

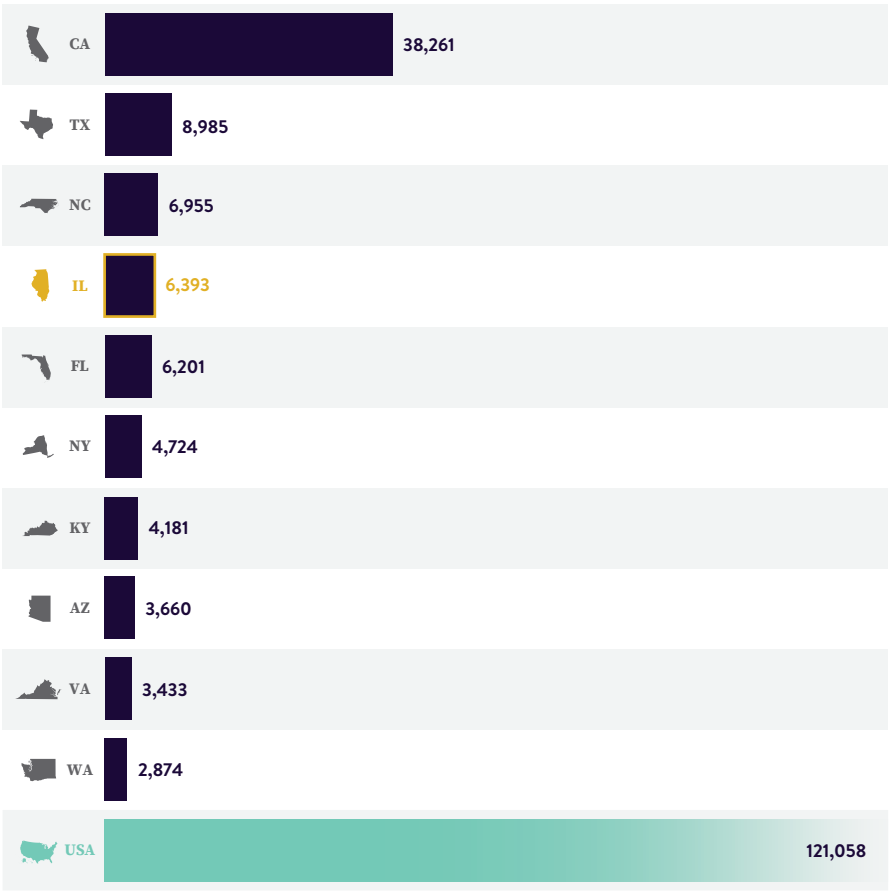
In 2021, 6,393 individuals received a certificate, requiring less than 4 years of coursework, or an associates degree in Illinois that was STEM-relevant. Encouraging the inclusion of a more diverse array of candidates for STEM positions must include expanding opportunities for non-4-year degree recipients. To enable the tech workforce of tomorrow, ISTC is expanding our analysis of the STEM Talent supply in Illinois to include individuals who pursue two-year degrees and STEM-relevant certificates.

In 2021, Illinois ranked 4th in the nation in the number of individuals receiving these sub-baccalaureate certificates and degrees. Illinois ranked 11th in the number of Computer Science focused certificates that were awarded to students in the state and 2nd in Interdisciplinary studies.

Community College Graduates in STEM Degree Areas

Top 10 States

2021



Since 2017 there has been less of these sub-baccalaureate awards going to Illinois students. Nearly 8800 students in 2017 were awarded STEM-related certificates requiring less than 4 years of coursework but that total fell in each successive year. The number of graduates in Illinois has fallen by 8% annually since 2017 whereas at the federal level the total has increased by 6% annually over the same time span.

▲ *The Center 4 Information Technology Acceleration's First Cohort of Chicago City College Apprentices*

COMMUNITY HIGHLIGHTS

CITY COLLEGES of CHICAGO

C4ITA SEEKS TO BUILD AN EMPLOYER NETWORK FOR HIRING SOFTWARE APPRENTICES

Currently apprenticeships are underutilized as a pipeline for fulfilling the demands of the IT sector in Illinois. Many have taken note of the current lack of innovation regarding hiring and the problems that creates. One such pipeline that employers have yet to fully embrace is the Software Development Apprenticeship (SDA) program created by the Center for IT Talent Acceleration (C4ITA) in Chicago. The SDA program collaborates with City Colleges of Chicago (CCC) and provides young learners from diverse backgrounds opportunities to attend Wilbur Wright College at City Colleges of Chicago in pursuit of a Software Development Associate's Degree. Many of their students found themselves without a clear pathway to career readiness upon completing high school. The Center's goal is to create 500 employment-ready coding, software development, and IT talents with the experience that Chicago's employers of all sizes are looking for when recruiting applicants.

ISTC sat down with C4ITA Founders in January to get their perspective on the biggest hurdles for apprenticeship programs like the SDA. President Anand Setty outlined the challenges as "Employers express three main concerns to us when approached about the possibility of the Apprenticeship; bandwidth availability for current employees to mentor an apprentice, past struggles with apprentices, and the length of time it usually takes to establish a strong apprenticeship program." SDA's approach to meeting these challenges rests in demystifying the process and making the program accessible for small and midsize employers

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in the Chicago area. Secretary John Hart shared their approach; "Our framework addresses the concerns we've heard from employers. Apprentices participating in the SDA start working right away while attending college full time and must have experience in high school taking a computer learning course." The gap between available talent and the need for software programmers is what motivates the team at C4ITA and CCC.

Employers may be hampered by the costs associated with participating in apprenticeship programs, which can sometimes be prohibitive, especially for smaller and mid-size companies. Luckily, Illinois has moved to get in front of this issue and in 2019 Governor Pritzker signed 'The Apprenticeship Education Expense Tax Credit Program.' Employers are eligible for a credit of up to $3,500 per apprentice and an additional credit of up to $1,500 for each apprentice if the apprentice is from an underserved area or the business is headquartered in an underserved area. Additional legislation at the federal level, like the creation of a two-tiered nationwide apprenticeship tax credit program, may assist job creators in building these new pathways to success for under-resourced communities.

STEM TALENT DEMAND

The COVID-19 pandemic had an impact on the job market in Illinois throughout 2020 and 2021. Job loss was seen across almost every industry and recovery in the years since has been slow. Over the past decade, employers added 68,440 new STEM jobs to the Illinois economy, however, there was a lull in growth in 2021 due to the pandemic. The annualized growth rate over the previous five-year period is negative (-1%) due to the disproportionate impact of the pandemic.

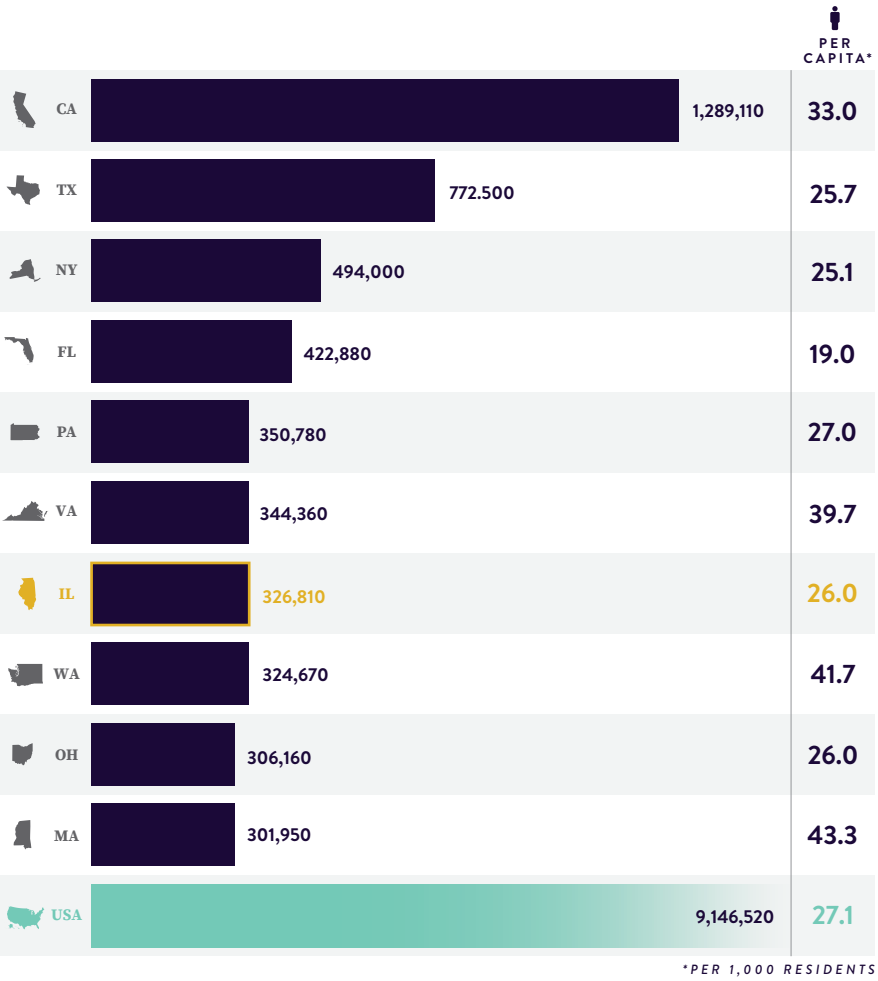
Illinois job growth slows during the pandemic

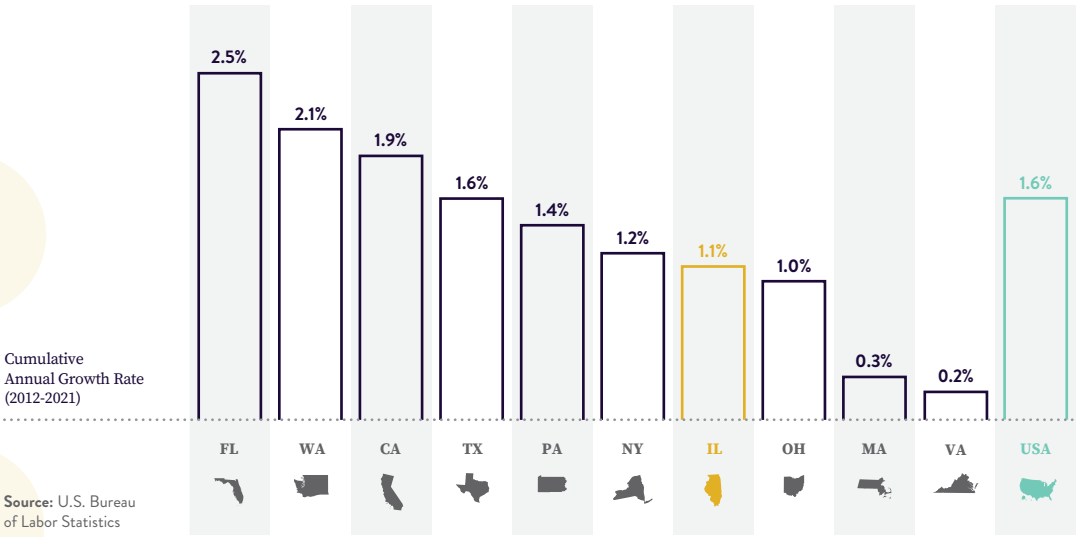
Between 2020 and 2021, there was a 1% reduction in the number of STEM positions filled nationwide. This amounted to a fall of 149,100 year-over-year. During this same time period, the number of STEM positions filled by Illinois workers dropped by just under 15,000. This accounts for a 2% drop. Non-STEM employment remained almost exactly the same in Illinois, meaning the STEM share of total employment fell off a bit from the 6% seen in 2020. Other states were similarly impacted. Georgia lost about 2% of STEM Jobs (10,620) between 2020 and 2021, while Massachusetts lost 3% (15,300).

STEM Jobs by State

Top 10 States

2021





Source: U.S. Bureau of Labor Statistics

Within Illinois' workforce, approximately 6% of jobs in Illinois are STEM-related, according to the most recent data from the Bureau of Labor Statistics. A total of 326,810 STEM jobs were in Illinois in 2021, and despite the loss of jobs, the state still placed 7th overall in the nation. The 10-year cumulative average growth rate was 1%, which is slightly less than the 10-year national growth rate of 2%. This means that over the last 10 years the average state has slightly outpaced Illinois in terms of job growth in tech sectors.

▲ *The Federal CHIPS+Science Act was signed in August of 2022*

COMMUNITY HIGHLIGHTS

Northern Illinois University

APS Advancing Physics

CHIPS AND SCIENCE ACT PROGRESS 'FIRST STEP' IN REVERSING INEQUITIES

In a piece that was published in 'The Hill', ISTC Board Member Dr. Gerald C. Blazey and Dr Robert Gates, then president of the American Physical Society reported on an analysis by collaborators from NIU and the American Physical Society showing the distribution of federal research funding creates an inequity for students of color, Using data from the National Science Foundation's Science and Engineering Indicators and from the Integrated Postsecondary Education Data System they showed that two-thirds of the nation's students of color benefit from only one-tenth of federally funded research opportunities. This impedes the retention of students of color and the

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diversification of the STEM workforce, Drs. Blazey and Gates acknowledged that important legislative steps were being taken to enable emerging research institutions to build their STEM footprint.

We are happy to report that important provisions broadening scientific research funding were incorporated into the recently passed CHIPS and Science Act. One of those provisions requires NSF to embark on a five-year test program that allocates at least 25% of multi-institutional awards exceeding $1M to emerging research institutions (ERI's). ERI's include a number of Historically Black Colleges and Universities (HBCUs). There is currently no single HBCU with a R1 research institution status which many have attributed to systemic inequities, with most pointing towards decades of underfunding. Ideally, the CHIPS and Science Act will be a first step towards reversing these funding trends. There is much yet to be done in science equity, but this new, landmark legislation offers a great start.

▲ *Lynne Mohr's Cousin, George Mauerer, prepares to embark on fundraising bicycle trek*

COMMUNITY HIGHLIGHTS

College of DuPage

LYNNE MOHR SCHOLARSHIP FOR SKILLED TRADESMEN

The Illinois Manufacturers' Association (IMA) announced in January of 2023 that Kenneth Rosales is the recipient of the 2023 Lynne Mohr Scholarship from the IMA Education Foundation. Kenneth is a student at the College of DuPage studying construction management. The goal of this scholarship is to provide a clear pathway to success for students studying in a skilled trade related field. Manufacturing and construction have long been keystone sectors for the Illinois economy and these $1,000 awards are available to Illinois residents demonstrating a passion for working with their hands. Last year's award recipients were all from Heartland Community College which prides itself on preparing students for in-demand roles within fields like renewable energy, industrial technology, and robotics. It is important that these fields have the requisite know-how

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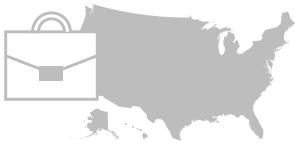
and that starts with creating a base of tech talent here in Illinois who are prepared to pursue a career in advanced manufacturing and other trades.

The Lynne Mohr Scholarship is named in honor of Lynne Mohr, the former president of the Arlington Heights-based car wash manufacturing company 'Brite-O-Matic.' This scholarship is just one part of the work being done at IMA to uplift the state's manufacturing sector. They've provided nearly $250,000 from their Foundation to address gaps in STEM education and to advise students regarding the skills they'll need to succeed in the fast-paced, tech-enabled, world of today. Their efforts are done in accordance with their goal of creating and reinforcing a strong workforce pipeline to mainstay and upstart sectors in the Illinois manufacturing ecosystem.

Computer fields make up almost half of all STEM jobs in Illinois

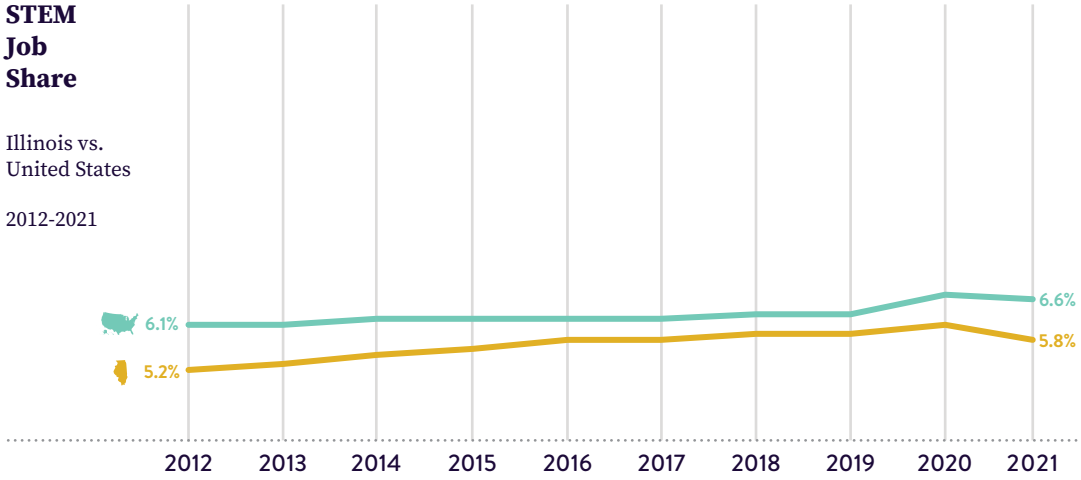
Computer science continues to dominate STEM jobs in the state. This growth can be largely attributed to the increased demand for computing skills—particularly software development and programming skills—across industries. However, declines in job numbers are seen during the last two years, which can likely be attributed to the COVID-19 pandemic.



STEM Job Share

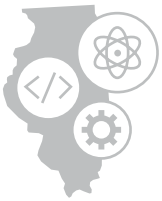
Illinois vs. United States

2012-2021



Source: U.S. Bureau of Labor Statistics

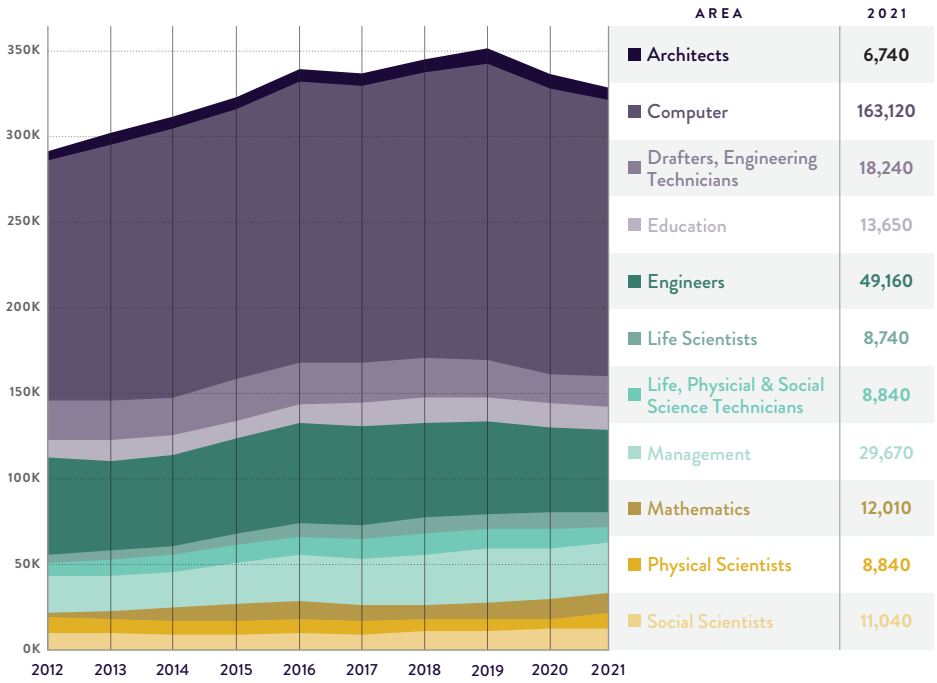
In 2021, computer science remained Illinois' largest STEM field, making up almost half of all STEM jobs in the state. However, the field is experiencing some job loss. After having a record-high year in 2019 with 174,450 computer science jobs and being ranked 6th nationally, jobs in the field have declined over the past two years. In 2020, the number dropped to 168,760, and in 2021 it slipped even further to 163,120, now ranking Illinois 7th nationally for computer science jobs.



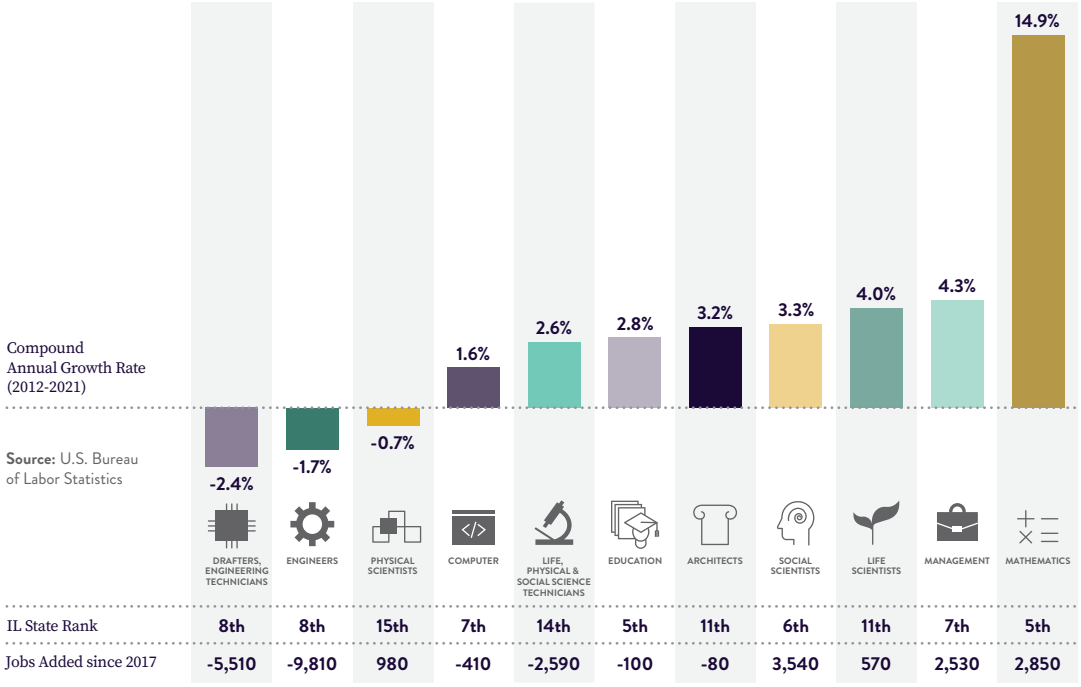
STEM Jobs by Field

Illinois

2012-2021



Other large STEM sectors in Illinois include mathematics (12,010), social scientists (11,040), and STEM-management roles (29,670), with national rankings of 5th, 6th, and 7th, respectively. Although engineering jobs experienced a slight decline from a high of 58,970 in 2017 to 49,160in 2021, the state still ranked 8th nationally. Illinois also ranks 5th nationally for STEM jobs in education, which includes post-secondary faculty members in the sciences, most of whom are participating in research. These STEM roles continue to be higher paid positions than the average non STEM job and according to the U.S. Bureau of Labor Statistics, STEM jobs are growing at a rate two times faster than the total for all occupations (11% vs 4.9%). STEM careers offer the fastest route for improving social mobility and economic stability. However challenges are certainly present foundationally, in Illinois and nationwide. The lack of equitable access to these high-paying career paths remains entrenched.

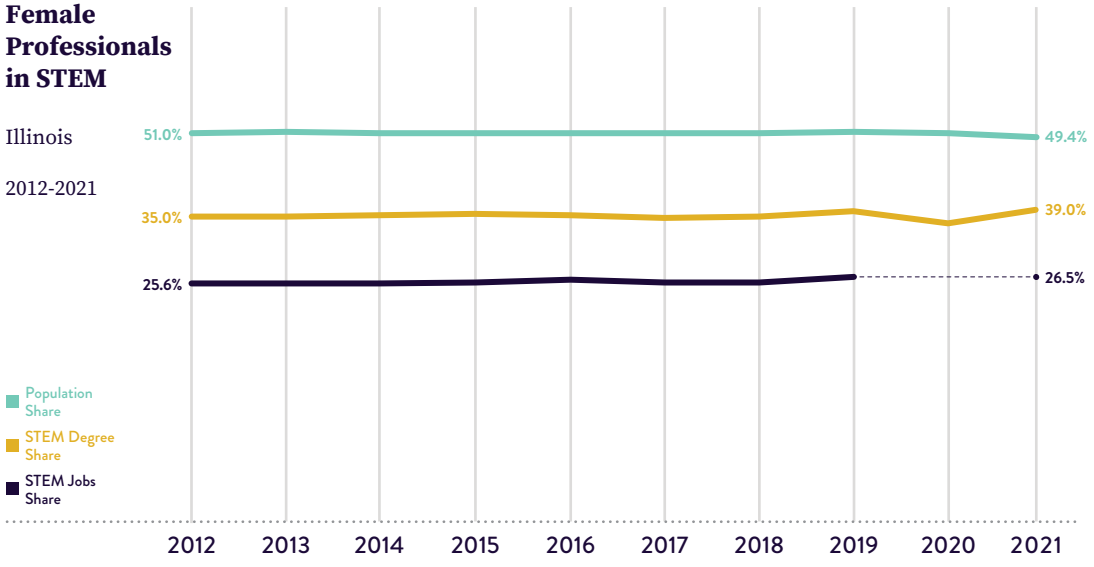


DIVERSITY, EQUITY, AND INCLUSION IN ILLINOIS

DEI progress lacking for Black Illinoisans

The STEM workforce pipeline continues to be unrepresentative of the extremely diverse population of Illinois. Women, Black, and Latino populations make up only a fraction of the STEM workforce in Illinois despite recent growth for Women and Latino individuals on university campuses. Black and Latino Illinoisans make up 15% of the state's STEM workforce despite representing 34% of the state's population according to 2021's data.

STEM degree completions for women in 2021 are the highest that ISTC has ever recorded. Since 2012, the number of women conferred a STEM degree by Illinois universities has increased by 6% on average each year. In 2012, Illinois awarded STEM degrees to 6,120 women (34% of all recipients); in 2021, women received 10,648 (39%) STEM degrees. Even with the record number of women completing STEM degrees in Illinois, they remain underrepresented in STEM jobs. In 2021, women made up 27% of Illinois' STEM workforce. The share of women in Illinois in STEM jobs has grown by less than 1% since 2012. 27% also represents a fall from the high water mark of 27% in 2016. A 2018 Pew Research survey looked at this exact phenomenon and found that women who received



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System, U.S. Census Bureau

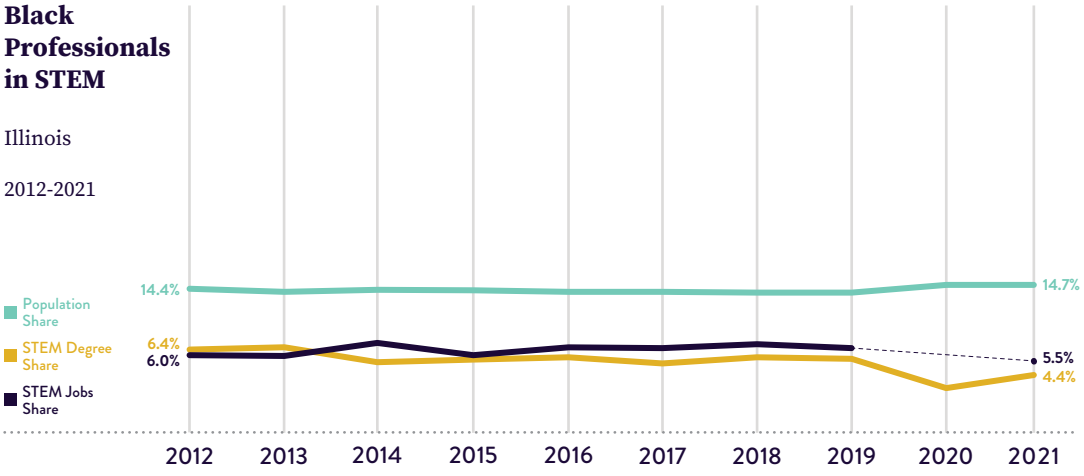
a bachelor's degree in engineering or computer science were significantly less likely than men who received like degrees to be employed in a role related to their major. Women in STEM careers report being discriminated against at work, earning less than a male colleague in the same role, and being treated as if they were incompetent, more so than do their female peers in non-STEM roles. While women in STEM are more likely to experience discrimination, this problem is even more pronounced among women in computer roles. 50% of women in STEM overall report facing discrimination but nearly 74% of women who are software developers, programmers, or data scientists report facing harassment based on their gender.

Equity and inclusion in the STEM pipeline for Black Illinoisans have seen minimal progress over the last decade. Despite making up 15% of the population of Illinois, Black individuals comprised only 4% (or 1,203) of STEM degree earners in 2021. While the total number of STEM degrees awarded to Black students in Illinois has increased since 2012, when 931 degrees were awarded to Black students, this total represents a decrease in terms of the composition of all Illinois STEM degree earners. In 2012, the 931 Black students who earned a STEM degree consisted of 5% of all STEM degrees. Black professionals in Illinois make up only 6% of STEM jobs, which is less than what was reported in 2019 (the last year data was compiled before the pandemic). Similar to Black STEM degree earners, there has been a 1% decrease in Black STEM professionals over the past decade.

Black Professionals in STEM

Illinois

2012-2021



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System, U.S. Census Bureau

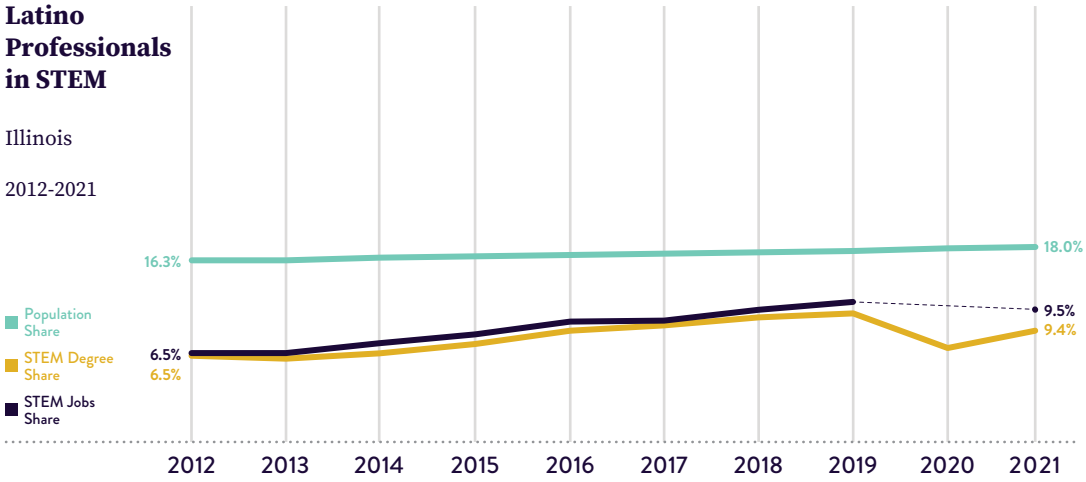
Illinois' Latino population, however, has experienced more gains in STEM degree completion and in the workforce over the past decade. While degree completion for Latino Illinoisans has fluctuated over the last two years, these numbers have generally trended upward year-over-year. In 2019, Latinos made up 10% of all STEM degree earners in the state, but in 2020 this fell to 7% during the pandemic. In 2021, representation for Latino students completing STEM degrees in Illinois rebounded to 9%. Since 2012, degree completions for Latino students have more than doubled. Progress to increase equity and inclusion in STEM jobs for Illinois' Latino population has also been positive.

Latinos comprise 18% of the state's population and 9% of the STEM workforce—the highest on record. This increase is quite significant. In 2012, there were 24,613 Latinos in STEM jobs. Although there were a couple of years where the numbers have seen a slight decrease, over the 10-year span; Latinos in the Illinois workforce have steadily increased. In 2021, there were 49,160 Latino employees in STEM jobs in Illinois– almost double the amount from 2012. From 2018 to 2019, the Illinois STEM workforce saw its highest one-year increase in Latino employees, going from 34,654 to 42,002.

Latino Professionals in STEM

Illinois

2012-2021



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System, U.S. Census Bureau

COMPUTER AND SCIENCE IN-DEPTH

Illinois Leads in Computer Science Degree Completion

Illinois remains a leader in computer science and data science talent production. For several years, this Index has tracked the quality and quantity of computer science degree programs in the state. When it comes to the share of computer science degree completion, Illinois outpaces the national average—5% vs. 4%.

In 2018 and 2019 computer science degree production in Illinois declined slightly in both years, but gains in 2020 and 2021, show a steady, upward trend. In 2021, Illinois conferred 5,822 computer and information science degrees—a record number for the state. It is one of the fastest-growing STEM subject areas over the last 10 years with a cumulative average growth rate of 10%. Illinois now ranks as the 2nd largest producer of computer science degrees nationally.

The top producer of data science degree graduates in Illinois is the University of Illinois Urbana-Champaign, with 1,141 graduates coming from the institution. Other top data science degree producers include the University of Chicago (733 graduates) and DePaul University (306 graduates).

▲ *Chair of the Biochemistry and Molecular Biology Department at SIUC, Dr. Buck Hales, in attendance at the 2022 Cannabis Science Symposium*

COMMUNITY HIGHLIGHTS

SIU Southern Illinois University CARBONDALE

SOUTHERN ILLINOIS UNIVERSITY CANNABIS SYMPOSIUM AND PHOENIX SCHOLARSHIP

Southern Illinois University launched its Cannabis Science Center in fall 2021 as part of an ongoing effort to catalyze research into the potential medical uses of cannabis. One such potential medical application is the use of cannabinoids—and active ingredients like cannabidiol (CBD)—to treat cancer. One aspect of the Center's goals is the creation of a diverse, talented

continued on next page ▶

workforce in plant biology and agriculture, cannabis law, medical applications, and analysis. Dr. Buck Hales, an SIUC Physiology and Biochemistry Faculty member, emphasizes the importance of the analysis aspect of the Center's work; "Analysis is an important component of the Cannabis Center's mission. Hemp, regardless of the variety or purpose of the plant, is considered 'hemp' when the THC content is less than .3% above that level the plant is considered as 'cannabis' and a high THC plant. When a hemp farmer's crop goes 'hot' meaning it exceeds .3% it has to be remediated or destroyed. Being able to monitor the THC content quickly is valuable to hemp farmers."

The Cannabis Science Center hosted the 3rd bi-annual 'Southern Illinois Hemp/Cannabis Symposium' on Sept. 17, 2022. It featured commentary from Chris Berry from the Illinois Hemp Growers Association; and Ryan Doherty at Hemp Ventures. Patrick Van Meter, of Midwest Natural Fiber, discussed the creation of a business model for processing hemp–from the farm to the processing plant. Hemp materials can be used to create new fibers for use in construction, manufacturing of paper products, animal bedding, composting, and textile creation. The Cannabis Center Faculty, including Drs. Gary and Mary Kinsel, use state of the art analytical techniques such as mass spectrometers to determine cannabinoid, terpene, flavine, heavy metal and pesticide levels in crops collected from the field.

In order to promote diversity within the cannabis research community, Southern Illinois University offers a scholarship for applicants from underrepresented communities that are part of the Intensive Controlled-Environmental Plant Production Certificate program. This program is intended to provide students with the entry-level skills needed to work in the rapidly expanding cannabis industry. Funding for the "Phoenix Cannabis Production Scholarship" was provided, in part, by Dr. Lawrence Hatchett, M.D., a Pritzker School of Medicine graduate and member of the advisory board for the Cannabis Science Center. Eventually the school hopes that this scholarship will be able to be used by students who are pursuing a Bachelor's Degree in Cannabis Horticulture upon the confirmation of the degree tract by the Illinois State Board of Higher Education.

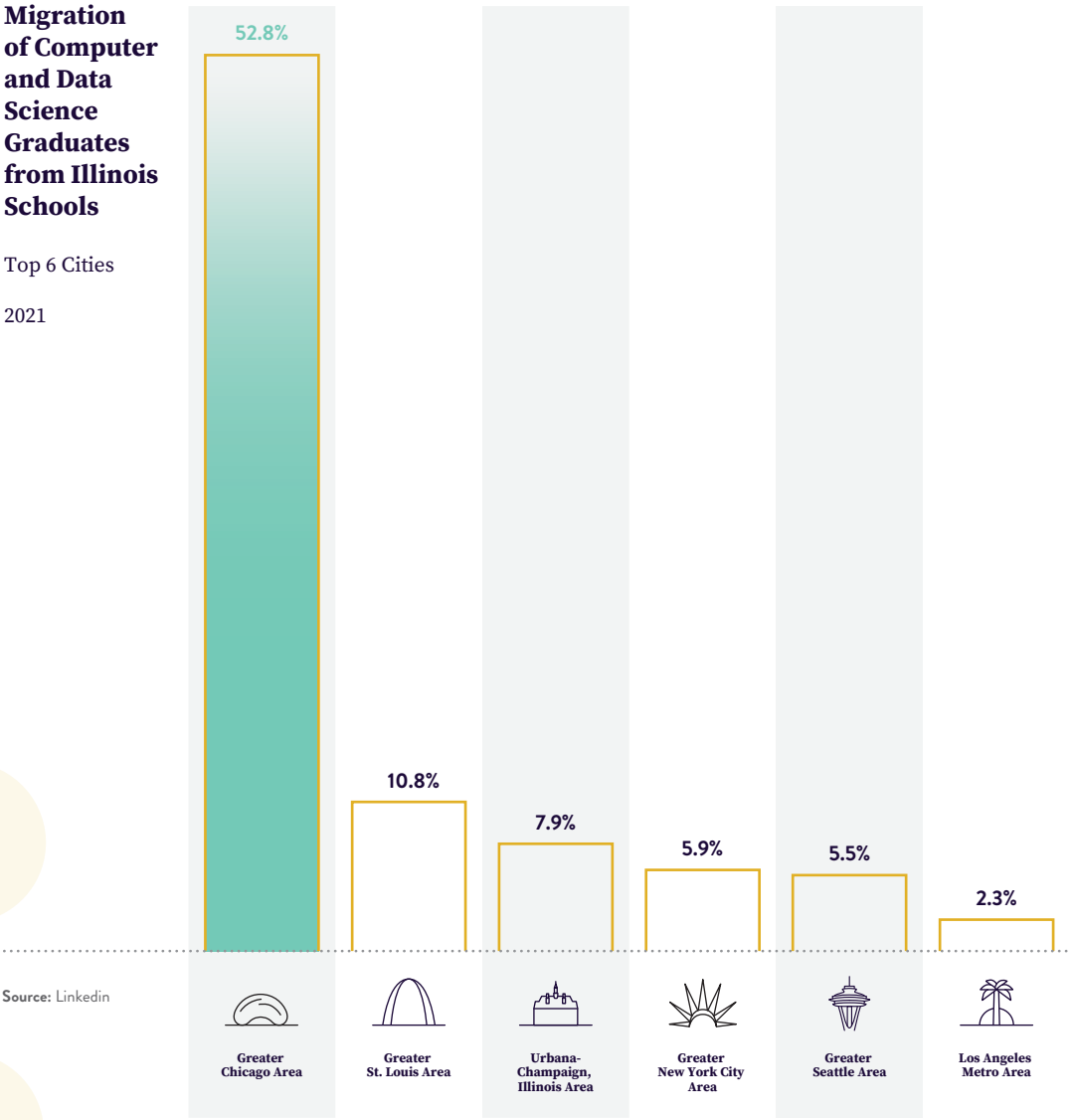
Data, Computer and Information Sciences Talent Retention

In Illinois, there are 35,383 recent graduates with a degree in data science or computer science, according to our data. Of these graduates, 21,944 have remained in the state after graduation. An estimated 62% of recent Illinois graduates with a data or computer science degree have remained in Illinois to start their careers. Just over 50% of these recent graduates over the last 10 years have positions at Chicago-based companies. Other top destinations where Illinois graduates migrate to include San Francisco (11%), New York City (6%), Seattle (6%), and Los Angeles (2%).

Migration of Computer and Data Science Graduates from Illinois Schools

Top 6 Cities

2021



Source: Linkedin

▲ *Pictured above are the key stakeholders within the Consortium*

COMMUNITY HIGHLIGHTS

UIC UNIVERSITY OF ILLINOIS CHICAGO

ILLINOIS DEFENSE MANUFACTURING CONSORTIUM (ILDMC)

The Nathalie P. Voorhees Center for Neighborhood and Community Improvement (Voorhees Center) at the University of Illinois-Chicago (UIC) College of Urban Planning and Public Affairs is leading a coalition of regional organizations known as the "Illinois Defense Manufacturing Consortium." This new Consortium received a $5 million grant through the U.S. Department of Defense's Manufacturing Community Support Program; the grant is supplemented by an additional $1.6 million from non-federal sources. The funding will be used to launch a Casting & Forging and Energy Storage Center of Excellence in Central and Northeastern Illinois. Led by the UIC Voorhees Center, the consortium members include one statewide agency (IMEC), and organizations representing four defense-intensive-regions in the northern half of the state (Northeast Illinois, Quad Cities, Peoria, and Rockford).Collectively the group represents areas that are responsible for more than three-fourths of the state's economic activity.

On the intended use of the funds, Yittayih Zelalem, director of the Voorhees Center, said, "This grant will allow the Illinois Defense Manufacturing Consortium to help enhance productivity through introduction of innovative technology and digital tools, as well as expansion of the skilled defense manufacturing talent pipeline. Consortium members use the interactive Illinois Defense Supply Chain Mapping Tool maintained by the Voorhees Center to survey the supply chain landscape and track the movement of products and services in the defense sector." Sustainable energy storage is seen as a major area of focus for the fight against climate change. While emerging energy solutions are becoming more feasible, the creation of ways to store such renewable sources of power has been behind the curve for a number of years. This investment will reverse that reality in Illinois, and hopefully lead to returns that impact the whole nation.

BIOMEDICAL AND BIOTECHNOLOGY IN-DEPTH

Illinois' Bio Talent Pipeline and Retention

The COVID-19 pandemic has increased the need for biomedical & biotechnology innovation. Illinois has been a leader in this field for decades and is home to the largest number of biomedical & biotechnology companies in the Midwest. Illinois had $5.04 billion in Research and Development funding for pharmaceutical manufacturing in 2019, according to ISTC's most recent R&D Index released in March of 2022.

In 2021, Illinois awarded 4,744 degrees in biomedical and biotechnology fields, including degrees coded within the major fields of biological sciences, physical sciences, and engineering. ISTC considers a degree title as belonging to 'biomedical sciences' if the degree and coursework could feasibly lead to a career in these sectors, so for instance; biomedical engineering is a degree title incorporated from the 'engineering major field.' Nationwide, the annual growth rate for biological degrees conferred was 4% between 2012 and 2021. Illinois' growth rate over the same span was behind the national curve at 1% annual growth since 2012.

Illinois fell from 6th nationally in biological science degree production to 10th in 2021. Engineering degrees have also increased rapidly since 2012 but, with an annualized growth rate of 3%, Illinois is behind the 4% national growth rate in this time period.

While degree production in Illinois has not kept up with national trends in these major fields, the Illinois biomedical and biotechnology pipeline remains strong. In 2021, an estimated 11,019 Illinois university graduates held roles within biotechnology or biomedical engineering, according to a review of LinkedIn data. A key to the continued job growth in the area is the retention of Illinois' recent biomedical and biotechnology graduates.

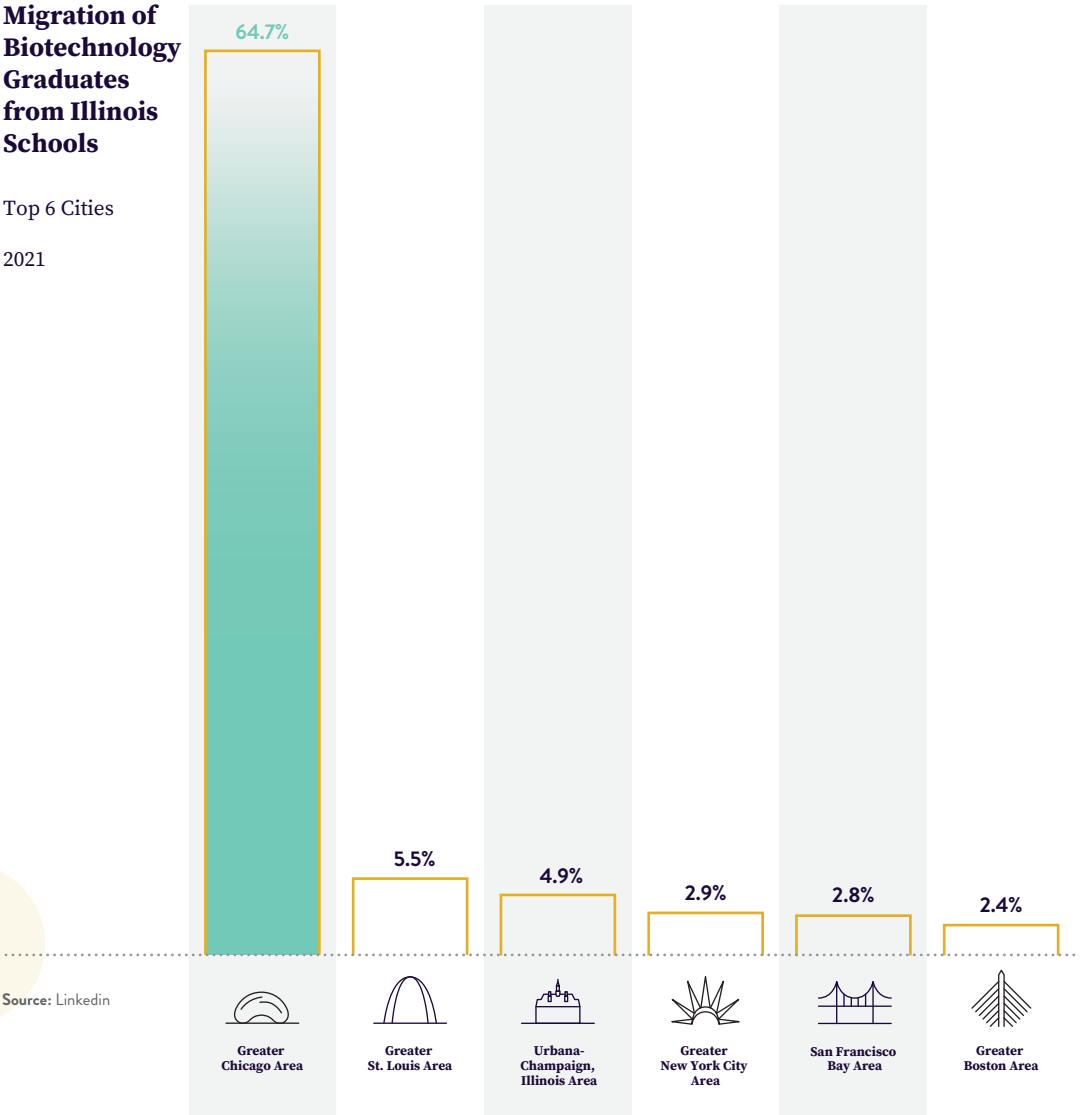
This issue of the Talent Index examines the location of Illinois' recent graduates in biomedical & biotechnology. Following the trend of previous years, recent graduates from Illinois universities are more likely to remain in the state than they are to take their skills elsewhere in the country. Over the last 10 years, an estimated 74% of graduates have stayed in Illinois.

Among recent biomedical & biotechnology graduates that do stay in the state, approximately 94% have found roles in the Urbana-Champaign and Chicago areas. In 2021, Chicago ranked as the top destination for recent Illinois biotechnology graduates, with 7,134 graduates (64%) electing to start their careers in the city. Urbana-Champaign is the 3rd most likely destination for recent graduates (5%). Other top destinations for recent Illinois biomedical & biotechnology graduates are St. Louis (5%), New York City (3%), San Francisco (3%), and Boston (2%).

Migration of Biotechnology Graduates from Illinois Schools

Top 6 Cities

2021



Source: Linkedin

▲ *Students and Staff for Illinois Tech's Chicago Difference Initiative meet for donuts on campus*

COMMUNITY HIGHLIGHTS

ILLINOIS TECH

THE CHICAGO DIFFERENCE INITIATIVE AT THE ILLINOIS INSTITUTE OF TECHNOLOGY

There is a gap in accessibility to STEM education. Illinois Tech is answering that call, launching The Chicago Difference—a community transformation and scholarship initiative aimed at developing and retaining talented young underrepresented science, technology, engineering, and math students from Chicago with an emphasis on recruiting students from the south and west sides of the city. Minority STEM students disproportionately face barriers to academic success. Social and cultural isolation, high financial need, lack of academic resources, stereotype threat, and insufficient career guidance are just some of the obstacles in their way. Illinois Tech launched The Chicago Difference in September as part of a fundraising campaign to promote diversity within STEM-learning, with a goal of raising $1 billion to support young learners, 160 of which were part of the program's first Cohort. Illinois Tech has made it clear that the purpose of the university is "to harness the collective power of difference to drive innovation that would otherwise not be possible" and this scholarship opportunity is a reflection of that purpose.

Students who receive financial support through The Chicago Difference scholarship initiative can expect to receive wraparound support before they even arrive on campus, while they are high school students, and after arriving at Illinois Tech. The goal of the scholarship is to give underrepresented local Chicagoans a chance to receive a high-quality technology-focused education and graduate debt-free, while also catalyzing innovation across campus and throughout the city. Finally, students will also receive mentorship and support services throughout their college journey as well as exclusive internships. These opportunities will help young learners coming from Chicago's south and west side neighborhood find a career path that is right for them.

LOOKING FORWARD

Empowering an equitable Illinois' STEM workforce

Illinois has one of the most diverse economies in the country. With over 200 institutions of higher education, we have a well-educated and ready workforce. With hundreds of Entrepreneurial Support Organizations (ESO's), we have a thriving technology, innovation, and entrepreneurship ecosystem, making Illinois well positioned for continued growth. The Illinois Department of Commerce and Economic Opportunity (DCEO) has identified six industries for targeted growth in Illinois which include Advanced Manufacturing, AgriBusiness and Food Manufacturing, Transportation-Distribution-Logistics (TDL), Life Science and Biotechnology, Energy, and Business-Professional Services. STEM education and STEM degrees are critical to these industries and Illinois' overall economy.

Illinois' Stem Workforce: Supply and Demand

Since 2013, STEM degrees have made up an increasingly large share of all degrees conferred in the state. Between 2020 and 2021 Illinois' growth rate (7.6 percent; 5th fastest growth in the country) significantly outpaced U.S. national growth of 3.2 percent in terms of STEM degrees awarded. The job market, however, was impacted broadly by the pandemic. Between 2020 and 2021, the number of STEM positions filled by workers dropped by just under 15,000, a 2.2 percent decrease year-over-year. Although Illinois is still ranked 7th overall in the nation for the share of its workforce involved in STEM trades, its annualized growth over the previous five-year period is -0.7 percent due to the disproportionate impact of the pandemic.

When we look at the *"supply and demand"* of STEM talent in Illinois, we have a robust, STEM ready workforce. When it comes to demand, Illinois is home to sixty-two Fortune 1000 companies and according to Intersect Illinois' 2022 Annual report, "from July 2021 to June 2022, Illinois saw 357 corporate relocations or expansions, bringing more than 16,000 jobs." As we look at our own Illinois Innovation Index: University Entrepreneurship report in 2022, university supported startups created 2,281 new jobs over the last five academic years and of the jobs created by these startups, 73.7% remain active. The Illinois STEM talent pipeline is meeting the **demands**, but are we meeting the **needs** of all STEM job candidates in Illinois? While gains have been especially pronounced in regards to STEM talent supply and degree conferrals, there is significant atrophy occurring following the completion of those degrees, whether they be four year or non-traditional pathways.

The greatest overall STEM talent challenge is the continued, critical underrepresentation of Women, Black, and Latino populations in the workforce. This is not a situation that is unique to Illinois, it proliferates across the nation. Black and Latino individuals make up 15 percent of the STEM workforce in Illinois and 34 percent of the population. Women make up 49.4 percent of the population, but just 26.5 percent of STEM employees, a figure that has not seen any significant growth over the last decade. Latinos still make up less than 10 percent of degree completions and employment in Illinois despite making up 18 percent of the population. There is a long history of inequities within STEM that has caused this imbalance, and there are no easy or quick solutions. However, more must be done to ensure women, Black, and Latino populations are represented in STEM fields. Some of that work includes re-investing in public education and doubling down on targeted programs, with a specific focus on underrepresented populations.

Next Steps: Nonprofit and Civic Institutions

Connecting employers to potential employees can be aided through proactive engagement and the creation of targeted programs; initiatives that often involve the non-profit sector. We must ensure that nonprofit and civic organizations have the capacity and funding to provide additional educational and workforce development programs created to support under-resourced communities. There are numerous organizations across Illinois with roadmaps for success. Thought leaders like the Chicago Learning Exchange, the Illinois Department of Commerce and Economic Opportunity, and P33 have established programming with proven results. In the educational space City Colleges of Chicago, Rend Lake College, and Heartland Community College have achieved progress in their communities. Others covered earlier in this Index include state-wide leaders at the Discovery Partners Institute and smaller impact programs like I.C. Stars, C4ITA, and other talent forward initiatives. In order to bridge the gaps, Illinois must be committed to sustainable investments in creating a STEM talent pipeline that is inclusive and equitable.

We'd be remiss in not mentioning our own work at The Illinois Science & Technology Coalition. Our educational institute develops and facilitates several STEM training and support programs for students K-12 whose mission is to develop the workforce of tomorrow. Our four programs, Mentor Matching Engine (MME), STEM Challenges, The 6 X 3 Project, and Teacher Externships have supported thousands of students and teachers across an average of 50 schools in 13 counties every year for the past 10 years. ISTC- Education programming provides students with real-world, hands-on STEM projects with major companies, pairing them with mentors who are leaders in their fields. ISTC's mission is to

support students in their educational journeys, helping them not only "see what they could be" in the world and inspiring a deeper curiosity of STEM, but also helping them with the skills they will need for success in the innovation economy and in other careers. Former MME and STEM Challenge Participants have gone on to pursue STEM degrees at Illinois colleges and universities. Our Ten Year Educational Impact Study takes a deeper dive into high impact, high dose educational opportunities.

Next Steps: Policy and Advocacy

Our state's collective efforts in navigating the economy through the impacts of the pandemic while also focusing on the roadmap for the future as a national leader means consistently building upon a foundation of access and opportunities for all. It means deeper insights and a more strategic and creative approach to supporting the next generation of young talent. This is also the time for Illinois policy leaders to examine why this gap continues and why the gulf is widening. Illinois has already attempted to widen pathways to a career in STEM, offering tax incentives to those employers who attempt to cover their apprentices education expenses. Employers are eligible for up to $3,500 in refunds per apprentice, with that cap rising to $5,000 per apprentice if that employee is from an underserved community or if the business is located within an underserved community. The Apprenticeship Education Expense Credit was passed as part of a larger bill in 2019 and has been under-utlized. Through calendar year 2021 just 22 total companies have benefited from the expense credit. Of the 47 apprentices assisted in 2021 just a quarter came from underserved backgrounds (DCEO).

Another legislative step the state could take is enhancing the tax credit already available to employers. While the Apprenticeship Education Expense Credit was an important first step, many other states have also provided paycheck assistance to businesses employing apprentices from under served backgrounds; these states include Arkansas, Massachusetts, Tennessee, Connecticut and New York. Expanding the definition of underserved could also prove to be a useful way of expanding access to apprenticeship programs. Currently businesses only qualify for the enhanced assistance cap of $5,000 if they or their apprentice reside in an underserved area. By providing an individual level qualification schema, whereby an individual apprentice would allow a business to qualify for the enhanced credit if they or their family has received federal public benefits, reduced price lunches, or been involved in the justice system, more businesses may be incentivized to engage with Apprenticeship programming. New York's Empire State Apprenticeship Tax Credit could be a useful approach for Illinois to expand access to STEM.

Next Steps: Corporate Illinois

Most importantly, industry leaders are critical to this conversation and must remain active, invested, and supportive of students in these pipelines and the equitable opportunities they offer.

They must also recognize that the old, unsuccessful ways of recruitment, hiring, and retention are over and that committed, thoughtful, responsible internal change, partnering with diverse, successful disruptors in this arena is successfully moving the needle and changing the face of the workforce of tomorrow.

Apprenticeship programs and the creation of new pathways to careers in STEM would be valuable investments for companies, especially as a means of increasing representation for non-traditional college students. ISTC supports continued higher education in our college and university system, but we know this isn't a path for everyone. Through the pandemic and expanded virtual learning opportunities, people across the U.S. completed online college-alternative programs that offered training in fast-growing fields while companies large and small conducted reviews of their hiring practices in a changing world. Many of these companies no longer require a four-year degree, opening STEM opportunities for a larger population.

The diversity talent pipeline is not a myth, but it's not as dire as many companies think. As our report and many others have concluded- there is a long history of disconnection between getting the degree and getting the job. There are decades of research on the WHYs and HOWs of making it better, still the issues remain. This topic can be complicated yet the throughline continues to be clear: Representation matters and we must do better.

INDEX DATA PARTNERS

LinkedIn

NCES

U.S. BUREAU OF LABOR STATISTICS

United States® Census Bureau

ILLINOIS

Innovation Index