STEM Starter Academy Annual Evaluation Report, Year 10

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STEM Starter Academy

The goal of STEM Starter Academy is to recruit, ready, retain, and graduate a diverse group of community college students earning STEM degrees and certificates and transferring to 4-year STEM programs and/or entering the STEM workforce.

STEM Starter Academy

The Department of Higher Education (DHE) launched STEM Starter Academy (SSA) at all 15 Massachusetts community colleges in January 2014. In response to actual and projected workforce demands, this system-wide initiative was designed to support students through community college STEM pathway programs that result in job placement within STEM professions or transfer to university STEM programs. SSA has brought together a learning community of state initiative leaders, college program staff, and college administrators to do this work.

The initiative connects students to STEM opportunities within the larger STEM ecosystem (e.g., 4-year colleges and universities, STEM employers) to enhance students' awareness of STEM, readiness for rigorous study, and preparation for careers in the STEM workforce. SSA provides interventions and supports aimed at increasing equity in access and outcomes for underrepresented and underserved student populations.

This report

Since the SSA initiative began in 2014, the UMass Donahue Institute (UMDI) has partnered with DHE as an external evaluator. The first part of this report provides a retrospective of the first 10 years of SSA: the initiative's impetus, core principles, development, key components, and qualitative accounts of its impact. The second part of the report summarizes quantitative findings related to the SSA initiative's overall effectiveness regarding key student outcomes (e.g., retention, transfer, completion) based on data from SSA Years 1 to 10 (2014–2023). These findings include descriptive data about SSA participants as well as results from rigorous statistical analyses assessing the impacts of SSA on student success.

Spotlight: Key findings

Overall, 62% of SSA participants have achieved positive outcomes (degree/certificate, 4-year transfer, retention) and have achieved those outcomes at higher rates than their non-SSA peers.

Black SSA participants, Latinx SSA participants, and women SSA participants have achieved positive outcomes and earned STEM degrees and certificates at significantly higher rates than their non-SSA peers.

SSA case management improved positive outcomes 1, 2, and 3 years after entry. Compared with their peers, SSA case-managed students earned STEM degrees and certificates at higher rates.

Contents

SSA at a Glance

All graphics on this page include data from Spring 2014 through Fall 2023

Through a case management model and a set of strategies focused on supporting students along a throughline, SSA advances students toward the goal of a career in the STEM workforce.

SSA is designed to meet diverse student needs, ensuring that participants are accessing:

- rigorous academic curriculum
- wrap-around supports
- campus, peer, and industry relationships

SSA promotes student success through learning experiences that support every step from recruitment to completion

36,470 SSA participants

66% of SSA students retain, transfer, or complete after 1 year

17,885 received STEM pathway/career counseling

76% of case-managed students retain, transfer, or complete after 1 year

2,229 students case managed

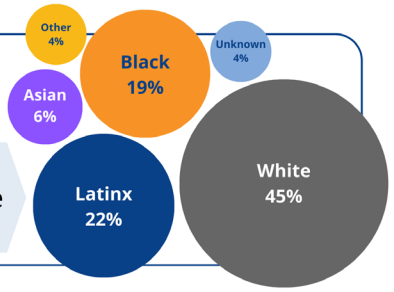
12,485 earned degrees or certificates

36% of participants are **25 years old or older** when they first join SSA

57% of participants are **part-time students** when they first join SSA

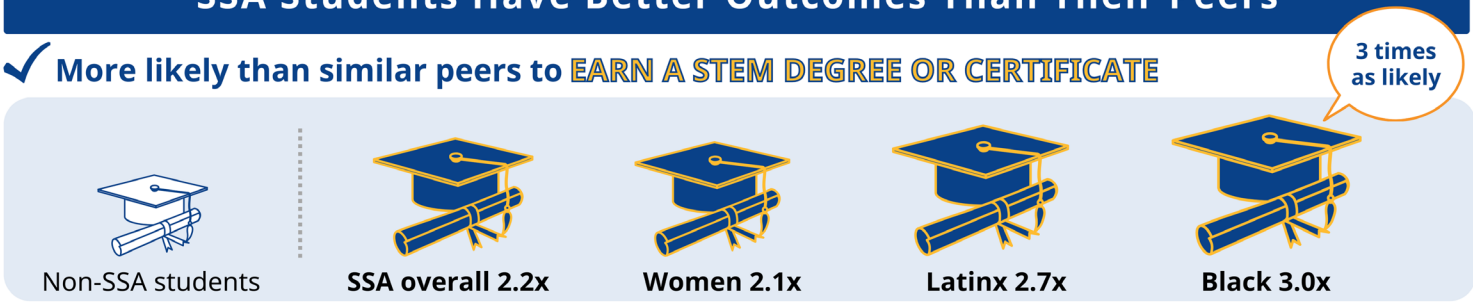
54% of SSA participants are **women**

SSA participants mirror the **racial/ethnic diversity** of the overall community college population



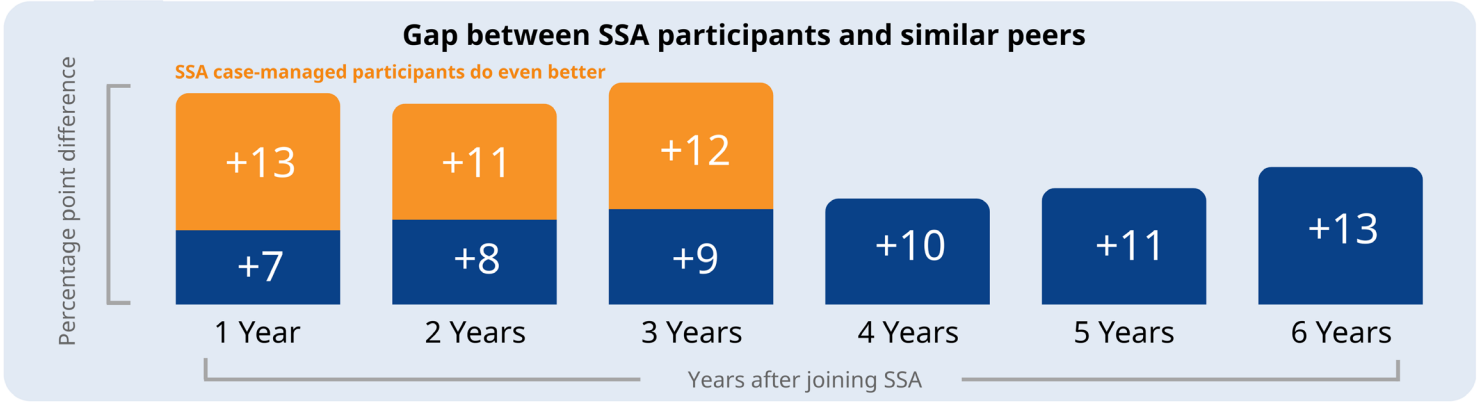
SSA Students Have Better Outcomes Than Their Peers

✓ More likely than similar peers to EARN A STEM DEGREE OR CERTIFICATE



*This illustration shows odds ratios for earning a STEM degree or certificate among SSA participants 6 years after joining SSA, compared with similar peers. SSA participants are **statistically significantly** more likely to earn STEM degrees and certificates 2, 3, 4, 5, and 6 years after joining SSA.*

✓ More likely than similar peers to HAVE A POSITIVE EDUCATIONAL OUTCOME



This illustration compares the percentage of SSA participants with a positive educational outcome with the percentage of similar non-SSA peers with a positive educational outcome. Positive outcomes include completion, retention, transfer, or STEM employment. Case-managed participants have only 3 years of outcome data available.

10 Years of SSA: Program Development, Components, and Achievements

The Massachusetts Workforce and SSA

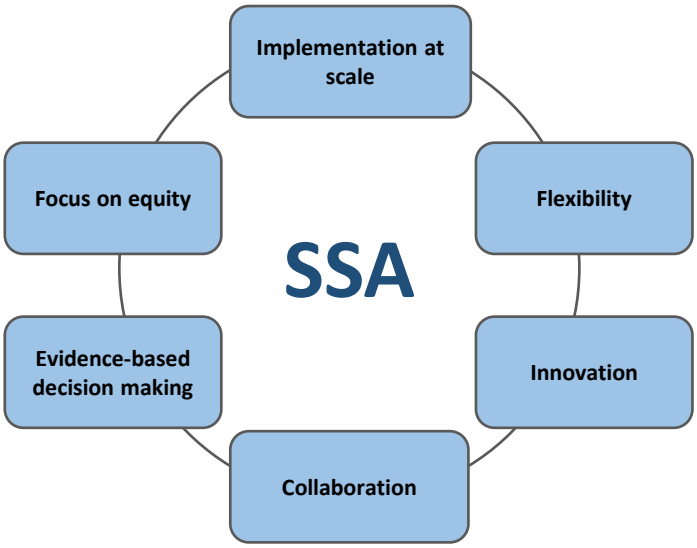
SSA was created to help provide a larger and more diverse STEM workforce.

Then: In 2013, Speaker Robert DeLeo of the Massachusetts House of Representatives recognized that Massachusetts would need a larger and more diverse STEM workforce. To address this need, the Massachusetts legislature funded—and DHE launched—the SSA initiative.

Now: According to the most recent data available, 21% of the Massachusetts workforce is employed in a STEM industry, compared with the national average of 14%. Moreover, the projected rate of growth for STEM occupations in Massachusetts is 7.2%, while the projected rate of growth for all occupations is only 3%. After 10 years, the need for SSA is only more evident.

Return on investment: SSA has served more than 35,000 students over 10 years. Overall, SSA students are **twice as likely** as non-SSA students to achieve positive educational or workforce outcomes—including being **twice as likely to earn a STEM degree or certificate**. These results have been realized at a per-student cost of approximately $1,250.

Six core principles: In the design phase and early in the initiative, DHE and the SSA community adopted core principles that have guided SSA on the path to these successful outcomes.

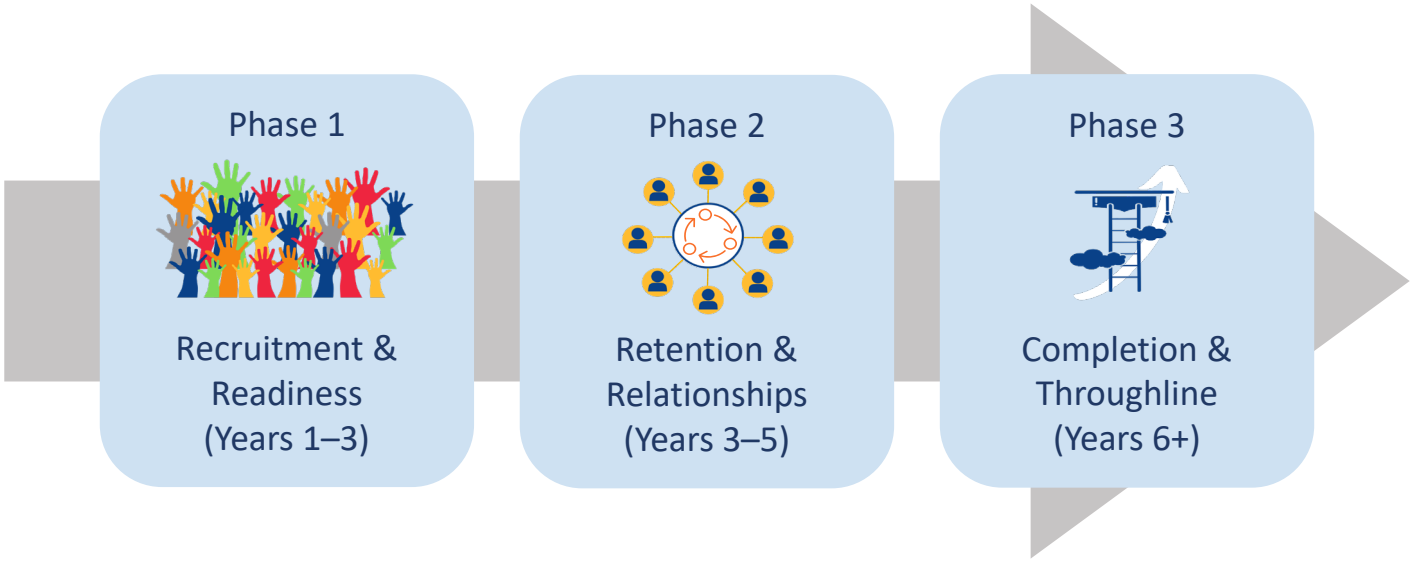


- ✓ DHE established SSA on a statewide level from the outset, with programs at all 15 community colleges opening simultaneously.
- ✓ DHE gave campuses flexibility to fill the gaps at their institutions.
- ✓ DHE encouraged campuses to develop innovative solutions.
- ✓ DHE facilitated a collaborative learning community across SSA staff and administrators.
- ✓ DHE began SSA with a commitment to evidence-based decision making grounded in periodic evaluation of program efficacy.
- ✓ DHE positioned equity—specifically gender and racial equity—as the guiding priority for SSA.

Fifteen tailored programs: At each of the 15 community colleges, the core principles of the SSA initiative crystalized in specific programming, which has been refined over the 10 years since SSA's inception. Each program reflects the character and meets the needs of the campus and local community. United by common elements that are central to the initiative and working to accomplish the common goal of supporting STEM students in their academic and professional pursuits, the 15 programs are also distinct. The SSA model is not one-size-fits-all but right fit—a reflective, intentional, creative, and data-driven design to recruit, retain, ready, and graduate STEM students and build a diverse and qualified STEM workforce in the Commonwealth.

Ten Years of Evolution and Adaptation

The SSA community has identified three phases of SSA's development across the first 10 years, with each phase representing a shift in the initiative's focus.



During **Phase 1**, SSA efforts were targeted at recruiting students into STEM pathways and readying students for college and for STEM disciplines. Programming was designed to build students' interest in and awareness of STEM fields, and to build STEM-specific college-readiness skills. Summer Bridge was a standard component of each of the 15 SSA programs. By the end of Phase 1, SSA activities were established on campuses and had gained visibility. "STEM Starter Academy" programming was assuming an identity and was central to STEM on campuses, though the SSA moniker was not used consistently, and students participating in SSA programming did not necessarily identify themselves as "SSA students."

In **Phase 2**, efforts related to recruitment and readiness continued, but focus shifted to retention and completion. Relationships and connections were recognized as crucial for student success. SSA sites emphasized building relationships to connect students to each other, faculty, program administrators, and support resources. Activities focused on both academic and non-academic aspects of students' experiences. SSA program staff pursued additional strategies to support retention, including financial support and preparation for career and transfer.

By the end of Year 5, SSA data collected through the evaluation process showed that the majority of participants (over 75%) had been actively engaged with SSA for one term only. This led to a data-driven decision to adopt a case management model that would ensure supportive connections at every point along a student's trajectory from entry to completion. In **Phase 3**, SSA shifted to case management. This shift exemplifies the ways that DHE used data and evaluation results to shape the evolution of the intervention and is a reminder of DHE's commitment from the outset to implementing a system where trends like this could be observed.

In Year 6 of SSA and beyond, several developments occurred in the broader context of higher education and STEM in Massachusetts as well as globally. At DHE, addressing basic needs insecurity and racial equity became priorities. Among Massachusetts STEM employers, emphasis on building a diverse workforce increased. The COVID-19 pandemic accelerated already declining community college enrollment and produced new levels and types of student needs. SSA was critically aligned with and well suited to respond to each of these pieces of context.

SSA Components and Features

SSA program components common across community colleges

- ✓ **STEM student recruitment**
- ✓ **Case management**
- ✓ **Community building:** activities for cohorts of students; student clubs
- ✓ **Academic programming, support, and student aid:** Summer Bridge (between high school and community college); tutoring; supplemental instruction; mathematics support; scholarships; stipends; funding opportunities
- ✓ **Authentic/experiential learning:** research experiences; internships; field trips; speakers, presentations, and events
- ✓ **Career awareness, exploration, and discovery:** career development opportunities; industry tours; job shadowing
- ✓ **Career/transfer readiness:** academic, transfer, and career advising; peer, faculty, and professional mentoring

Student-centered and facilitative services

Case management, introduced into the SSA model in Year 6, provides a mechanism for ensuring that SSA resources are focused on areas of student need. For example, as basic needs insecurity has surfaced as a significant factor in college student experience and success, SSA case management has positioned program staff to build relationships with students that facilitate information sharing and referrals to services to meet basic needs (e.g., food, shelter, health care). The intention is to remove barriers to educational success to keep students on a path to STEM careers.

Preparation for employment demands

The work of SSA programs to recruit, ready, retain, and graduate STEM students has resulted in a valuable pool of STEM-skilled candidates. Career development supports, professional mentorship, as well as research and internship opportunities provide meaningful preparation to meet employment demands.

"Mentoring was implemented into our Summer Bridge Program and on our SSA Blackboard, [which] increased the participation in our mentoring program. Two of our case-managed students got co-ops from their mentor connections, and it may lead into a permanent job."
—SSA staff member

Readiness for an evolving landscape

SSA's case management focus positioned programs to respond to the immense challenges COVID-19 imposed on community college students. When the pandemic interrupted all aspects of learning and engagement, SSA was already implementing a model that could respond to individual needs and connect students to services and supports. (As shown on page 2, case-managed students have had even better outcomes than SSA students who were not case managed).

As COVID-19 recovery has progressed, SSA programs have returned to more in-person offerings and hands-on opportunities for students. At the same time, as part of an initiative that evolves and adjusts according to new data and new understandings, SSA programs have paired the return to in-person formats with additional flexibility. Adaptations and best practices stemming from responses to pandemic-era situations include hybrid programming and remote services to accommodate scheduling and transportation challenges.

"The new academic advising and coaching model offered surprising flexibility for students and advisors to connect. Through both texting and flexibility of virtual meetings, the negative impact of missed in-person connections was mitigated. Advisors were able to respond more nimbly to time-sensitive concerns."
—SSA staff member

Collaboration

As one of the core principles of the initiative and a guiding value of the SSA community, collaboration has sustained program efforts and magnified their effects.

The SSA initiative has fostered and thrived on collaboration to develop and deliver programming that effectively prepares community college students for the Massachusetts STEM workforce. Collaboration serves as a unifying and a multiplicative force, providing a support structure and shared responsibility for those doing the work and facilitating system-level impact from individual efforts. SSA collaborations exist across the community colleges, across departments within colleges, and between community colleges and local partners.

Collaborative professional community

The SSA initiative established and continues to develop a professional community of STEM staff and administrators across the 15 community colleges. With the support of DHE, this professional community shares ideas and engages in collaborative problem solving for SSA specifically and for STEM in the Commonwealth more generally. Facilitated monthly meetings and twice-yearly retreats provide the structure for this professional community; individual members' commitment to students, to STEM, to the SSA initiative, and to their own professional growth is integral to the community's continued relevance and evolution.

Collaborations across and within higher education institutions

SSA has led to meaningful collaborations that extend beyond the professionals directly involved with the initiative at the 15 community colleges. For example, through the SSA Transfer Academy program (see page 10 for additional information), relationships have been built between community colleges and 4-year institutions, fostering communication and new understandings related to preparation for and success with STEM student transitions from community college to 4-year schools. SSA staff have also built relationships with other departments on their community college campuses, with collaborations focused on STEM academic opportunities, tutoring, advising, and other student supports.

"We continue to discover the benefits of further enhancing/strengthening our collaborations with other departments at the college…. Through these relationships with Career Services, Student Activities, Multicultural Affairs, and the Library Learning Commons, we were able to provide an increased level of services for our students while at the same time sharing the responsibilities and the workload with those departments that have the same goals that we do in serving our students …. We continue to break down silos that tend to form on campus."
—SSA staff member

Collaborations with STEM employers

Collaborations between SSA staff and industry partners enable programming that connects STEM students and STEM employers. Guest speaker events, panels, job shadowing, research opportunities, internships, and mentoring offer great educational benefits to STEM students. These activities also provide employers with critical access to potential employees and opportunities to shape the training students receive.

"Throughout the year, we have STEM talks, tutoring, advising, October STEM Week, student STEM clubs, summer internships (REUs), partnerships that guarantee that they will accept some of our students."
—SSA staff member

Leveraging SSA for STEM growth

Programs report that SSA relationships have aided the growth of broader STEM opportunities at community colleges. As SSA has become a known entity and presence on campuses, STEM students and STEM offerings have gained increased attention. Administrators have used SSA to leverage additional funding for STEM initiatives, and DHE secured a grant from the National Science Foundation for MassTeach, a program that provides a pathway for community college students of color in STEM majors to enter the K–12 STEM teacher workforce.

Student Experience

Students and staff have indicated that SSA has had a positive impact on student experiences and outcomes. This impact has been corroborated by rigorous statistical analyses of student participation and outcome data.

The following percentages of students attributed these outcomes[1] to SSA (N > 4,000):

Improved knowledge/performance and stronger connections

- 81% *better knowledge of academic supports and resources*
- 74% *stronger connections with faculty*
- 74% *improved performance/achievement in courses*
- 71% *expanded knowledge of STEM fields and careers*

Greater confidence and self-efficacy in STEM

- 79% *"I can better understand the content in a STEM course"*
- 77% *"I feel more confident about asking questions in my STEM courses"*
- 76% *"I feel more confident that I can think like a STEM professional"*
- 75% *"I feel more confident that I will be able to use STEM-related knowledge and skills in my future career when needed"*

In site reports to DHE and in evaluation interviews with UMDI, SSA staff described the impact of the initiative on students from their perspective. Accounts varied across campuses and covered many different areas. Examples of impacts include a sense of community among SSA students and active student leadership.

"We also learned that students truly do crave a welcome space and community. They quickly joined us in our SSA spaces, and it was a great opportunity to witness the power of community as the students were engaged with each other on STEM-related topics and also encouraged their friends to be involved."—SSA staff member

"Almost the entire student government is SSA students. In the last 8–9 years, the Students Who Shine program, every single one but one has had a connection to SSA. When the president of the college needs people to talk to our delegation of lawmakers, they go to SSA."
—SSA staff member

Others described the critical support offered to students who may be experiencing life challenges and the impact of the initiative on community college culture.

"Having that single point of contact, a person to advocate for their needs that they can talk to about any issues they're having and having that as a resource they can utilize at any time has been a benefit to students that have had some barriers, whether that be childcare or mental health or any other number of things that might have stopped students from pursuing or completing a degree."—SSA staff member

"I'm proud of the positive impact on [our] campus culture as a whole. SSA has brought a lot of collaboration across divisions (e.g., academic division, student affairs). It has really put student experience at the center and has helped us think about experiential learning, building connections with students and best practices."—Community college administrator

Data and Evaluation

Cycles of evidence-based feedback, reflection, and revision have shaped SSA over 10 years.

Evidence-based decision making

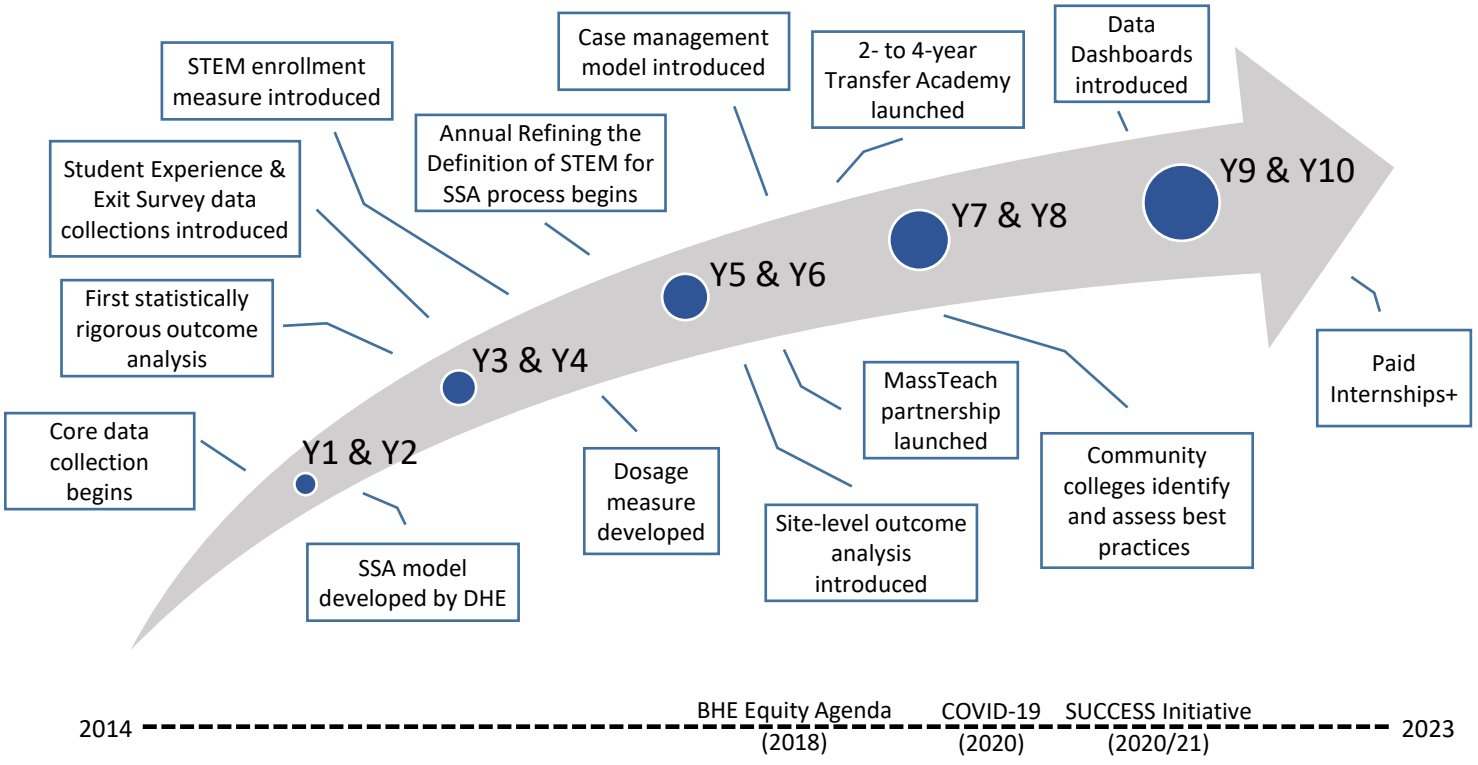
A commitment to consistent and thorough evaluation—examining outcomes systematically and with the best evidence possible—has been a core principle of SSA from the outset. The partnership between SSA and UMDI has resulted in 10 years of data collection and analysis that have driven decisions about the initiative. For instance, when data showed that most SSA students had been actively engaged with SSA for one term only, DHE initiated a shift to the case management model. SSA has moved through cycles of feedback, reflection, and revision that have shaped the trajectory of the initiative. Trends and shifts within the larger contexts of STEM and higher education have also factored into decisions and revisions. *The figure below displays some of the milestones along the journey from Year 1 to Year 10 and some important contextual backdrops.*

Evaluation-related activities

Activities conducted by UMDI and aligned with the objectives of the evaluation have provided scaffolding for the initiative. These include:

- ✓ Providing structure and support for collection of supplemental data that are used for evaluation of the initiative
- ✓ An annual process of refining the definition of a STEM program under SSA
- ✓ Differentiating student participation (high- and low-dose and primary and secondary participant groups)
- ✓ SSA Data Dashboards
- ✓ A first dive into STEM wage and employment data

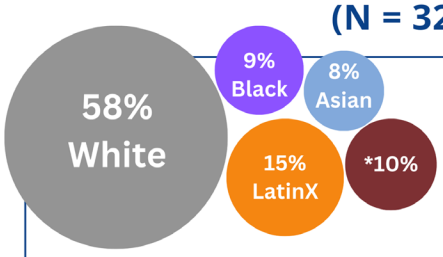
SSA Milestones, Year 1 through Year 10 (2014–2023)



SSA Transfer Academy

In 2019, DHE established Transfer Academy (TA) to complement the work of SSA with **targeted support for transferring community college STEM students**. TA extends SSA's commitment to increasing equity in access and outcomes for underrepresented and underserved student populations. Each TA program is administered by a partnership consisting of a lead community college and a public 4-year institution, and is **hosted by the 4-year institution**. TA students take a credit-bearing summer course free of charge and participate in activities designed to support their successful transfer.

TA Participants 2019–2022 (N = 320)



*Includes American Indian and Alaska Native, Native Hawaiian or other Pacific Islander, two or more races, Non-resident alien, and Unknown.

44% of TA Participants were **women**

34% of TA Participants were **25 years old or older**

Essential Elements of All TA Programs

Each TA program is specific to the institution that runs it, though each incorporates the essential elements that are universal to all TA programs. These include:

1. Offering college credits for coursework
2. Building supportive relationships with STEM faculty
3. Creating and integrating a community of peer students
4. Connecting to STEM support resources and wrap-around services

Key Findings

320 students completed a TA program between Summer 2019 and Summer 2022, and of these 37% were students of color.*

92% of TA participants (294 students) enrolled in the fall semester following their TA participation.

Overall, 79% of TA participants were retained from the fall semester following their TA participation to the next fall.

47% of the 2019 TA Cohort achieved a STEM 4-year degree within 3 years.

TA builds understanding among educators at sending and receiving institutions about expectations, students' needs, and the transfer process.

*Non-resident alien and Unknown are not included in the students of color percentage.

Conclusion from Transfer Academy Evaluation Report

While the early outcomes indicate that TA holds promise, the total number of participating students is relatively low, making it difficult to reach conclusions about whether the program is working as well as intended. DHE and partnering institutions may want to address (1) the alignment between program offerings and the needs/interests of transfer students; (2) the format and dosage of the intervention such that more students can benefit from this opportunity; and (3) recruitment. Continued communication and planning between community colleges, 4-year institutions, and DHE will be critical to advancing TA toward its full potential.

The content on this page is drawn from a report UMDI completed on the SSA TA program in the fall of 2023. TA is a complementary program of SSA and an example of how the initiative has evolved in response to needs identified through data collection and collaboration. UMDI's evaluation report provided descriptive analyses from the first 4 years of TA (2019–2022).

Findings

SSA Participant Characteristics

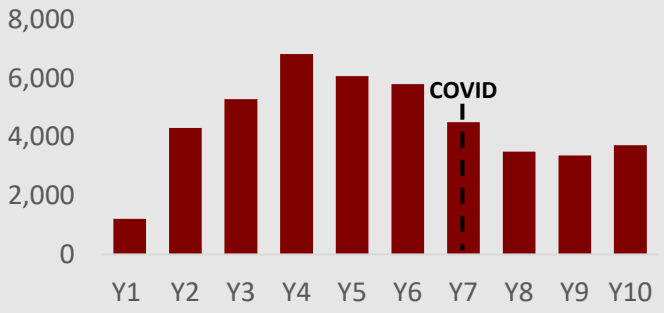
SSA participants reflect the diversity of community college students

SSA consistently serves a higher proportion of Black students compared with the community college population overall.

SSA participation

Through Fall 2023, SSA directly served a total of 36,470 participants. The number of SSA participants peaked in Year 4 of the initiative (2016–2017), remained relatively steady in Year 5 (2017–2018) and Year 6 (2018–2019), then declined in Year 7 (2019–2020) and Year 8 (2020–2021), and stabilized in subsequent years. Contextual factors such as the COVID-19 pandemic (effects starting in Spring 2020) and declining college enrollment, and the programmatic shift to a highly student-centered case management model (starting Fall 2019) likely contributed to this decline. Despite these contextual and programmatic factors, the SSA model continued to serve STEM and STEM-interested students.

Through Fall 2023, SSA has directly served 36,470 students

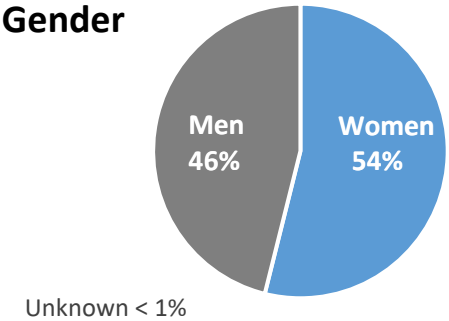


Demographic characteristics

SSA participants have a broad range of backgrounds, lived experiences, and perspectives, into which quantitative descriptive data offer a small window. Overall, just over one-third (36%) of SSA participants are considered non-traditional-aged students (not shown). These students are age 25 and older when they first participate. More than half of SSA participants (57%) attend school part time (not shown).

Just over half (54%) of SSA participants are women. While representation varies by year, this is important because women continue to be underrepresented in many STEM fields.[2]

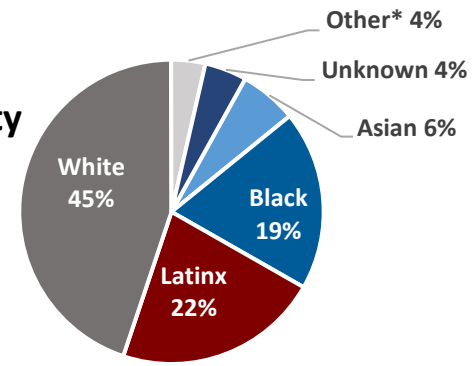
Gender



Unknown < 1%

Regarding race/ethnicity, participants are generally similar to the community college population, though SSA serves a slightly larger proportion of students of color. The percentage of SSA participants who are students of color has increased over time and is currently at least 47%. Knowing the demographic identities of SSA students is essential for tracking progress toward the initiative's goals of supporting students from entry through to completion and increasing diverse representation in the workforce.

Race/ ethnicity



*Includes American Indian and Alaska Native, two or more races, and non-resident alien

SSA Participant Characteristics

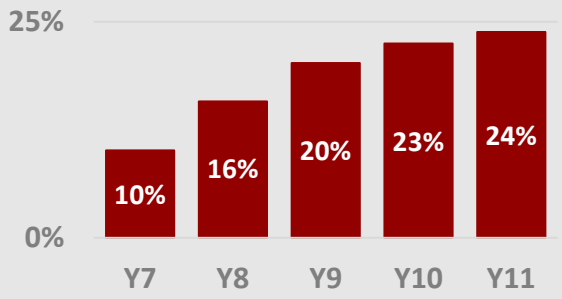
SSA case management participants reflect the diversity of SSA students and of community college students

An increasing proportion of SSA students have participated in case management over time, and these students are more likely to be STEM-at-entry than comparison groups.

Participation in case management

In Fall 2019, community colleges began providing case management to students through SSA; as such, case-managed students are a subset of all students served by SSA. Since Fall 2019, 18% of SSA students have been case managed through the initiative. The percentage of SSA students who were case managed increased each year, from 10% (455 students) in Year 7 to 24% (737 students) in the fall of Year 11.

SSA Case Management Participants



Case-managed student characteristics

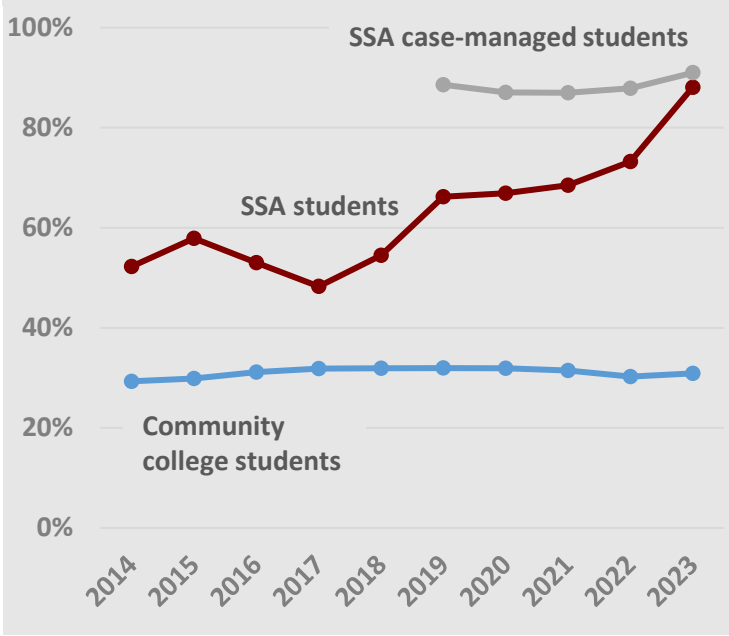
In terms of race/ethnicity and age, case-managed students are very similar to their SSA peers. However, case-managed students are more likely to be full time than SSA students overall (53% compared with 43%). The percentage of case-managed students who are women has generally increased over time, from 35% in Year 7, peaking at 52% in Year 9, and declining to 44% in the fall of Year 11.

STEM status

SSA was designed to serve STEM students as well as those who are STEM-interested but may be undeclared. STEM-at-entry students make up a consistently higher proportion of SSA participants than they do of the entire community college population.

Among case-managed students, the overwhelming majority (87–91%) each year were STEM-at-entry. Approximately one-half to over two-thirds (48–73%) of SSA participants were STEM-at-entry, and in Fall 2023 this reached almost 90%. Among community college students overall, approximately one-third have been STEM-at-entry over the span of the SSA initiative.

STEM-at-Entry Status:
Proportions of SSA, Case-Managed, and Community College Students (fall terms only)



Evidence and Outcomes

SSA students have continued to advance toward higher level outcomes

Participant data were analyzed to determine the highest outcome achieved as of Fall 2023. Each SSA participant was counted once, under the highest outcome achieved by that student. "Earned degree or certificate" was considered the highest outcome. "Transferred to 4-year institution" was the second highest outcome, followed by "Retained at original community college in Fall 2023," and then "Transferred to 2-year institution." Thus, a student who transferred and then earned a degree or certificate was only counted as having earned a degree or certificate.

Table 1 shows the results of this analysis. Overall, **almost two-thirds (62%) of participants tracked since 2014 earned a degree or certificate, transferred to a 4-year institution, or continued their education at a community college** (see "Overall" row). The percentage of students who earned a degree or certificate peaked at 8 years after their first participation (Year 3 cohort, 52%) and then plateaued (Year 1 and 2 cohorts, 49% each). SSA students continued to progress toward higher level outcomes despite pandemic-era challenges.

Table 1: Highest Outcome Achieved as of Fall 2023, by Year of First SSA Participation†

SSA year first participated	Earned degree or certificate	Transferred to 4-year institution	Retained at original CC in Fall 2023	Transferred to 2-year institution	Total positive outcome achieved	Indeterminate status
Year 1	49%	8%	2%	4%	**58%**	38%
Year 2	49%	9%	1%	4%	**60%**	37%
Year 3	52%	10%	2%	3%	**64%**	33%
Year 4	49%	10%	2%	3%	**61%**	36%
Year 5	44%	11%	3%	3%	**58%**	39%
Year 6	40%	11%	5%	3%	**57%**	40%
Year 7	35%	11%	8%	4%	**55%**	41%
Year 8	30%	10%	16%	4%	**56%**	39%
Year 9	14%	8%	38%	4%	**61%**	36%
Year 10	5%	4%	65%	1%	**74%**	25%
Year 11	0%	0%	99%	0%	**99%**	1%
Overall	**37%**	**9%**	**16%**	**3%**	**62%**	**35%**

†Mutually exclusive outcomes are listed from left to right in order of priority (e.g., "Earned a degree or certificate" is considered a higher outcome than "Transferred to 4-year institution"). Some primary participants are not trackable (i.e., are not found in HEIRS). This includes those who do not have an SSN and those who were assigned a student ID number but had not registered for a course.[3]

Methods note: Quasi-experimental modeling procedures

In addition to completing descriptive analyses like those in Table 1, UMDI evaluated the effectiveness of the SSA intervention using a rigorous, quasi-experimental comparison group design. These statistical analyses compared the outcomes of SSA participants with those of similar students who did not participate in the intervention. The methodology used ensured that pre-intervention differences in characteristics between SSA participants and non-participants—including STEM-at-entry status—were taken into account. Appendix B includes a full description of quantitative methods.

Two outcomes were assessed using this design:

1. Positive educational outcomes—a broad measure of student progress and retention that includes those who were retained, completed a degree or certificate, transferred to a 4-year institution, or joined the STEM workforce.
2. STEM degree and certificate earning at 2-year and 4-year institutions—an important measure of success that is part of the goal of the SSA initiative.

Results from these analyses are on the next two pages.

Evidence and Outcomes

SSA participants have achieved positive outcomes at higher rates than their peers, at all time points and across nearly all student groups

Overall and student group results

SSA participants were statistically significantly **more likely than their peers to achieve a positive outcome at every time point assessed** (1, 2, 3, 4, 5, and 6 years after entry).

Data for various student groups were also analyzed, as shown in Table 2. Student groups were based on **STEM-at-entry status**, **SSA supports received**, **race/ethnicity**, and **gender.** Assessing the statistical significance of modeling results allows for more certainty that the demonstrated impacts are not due to chance alone.

*Across all but one student group, **SSA participants out-achieved their peers** to a statistically significant degree at multiple time points.*

Spotlight: Positive outcomes and equity

Advancing racial equity by supporting students of color to progress in and complete their education is an important goal of the SSA initiative.

Black and Latinx SSA participants achieved positive outcomes at higher rates than Black and Latinx students not in SSA at each time point that was assessed (1, 2, 3, 4, 5, and 6 years after entry). This represents improvement compared with earlier analyses. However, **Asian SSA participants were not statistically significantly more likely to achieve a positive outcome at any time point assessed**.[4]

Table 2: Students Achieving Positive Outcomes 1 to 6 Years after Entry

SSA vs. Non-SSA, by Student Group, with Model Results ♈

	1 Year After		2 Years After		3 Years After		4 Years After		5 Years After		6 Years After	
Student Groups	SSA	non-SSA	SSA	non-SSA	SSA	non-SSA	SSA	non-SSA	SSA	non-SSA	SSA	non-SSA
All Students	66%***	56%	55%***	44%	51%***	40%	51%***	39%	53%***	40%	55%***	41%
STEM at Entry	67%***	55%	57%***	44%	52%***	39%	52%***	38%	53%***	39%	56%***	40%
Not STEM at Entry	63%***	56%	52%***	44%	49%***	40%	49%***	39%	51%***	40%	54%***	41%
SSA Aid	71%***	56%	60%***	44%	56%***	40%	57%***	39%	56%***	40%	59%***	41%
SSA Extra Support	69%***	56%	58%***	44%	54%***	40%	54%***	39%	55%***	40%	58%***	41%
SSA Counseling	71%***	56%	60%***	44%	56%***	40%	57%***	39%	59%***	40%	62%***	41%
SSA Case Managed	76%***	56%	63%***	44%	61%***	40%	Insufficient Sample		Data Not Available		Data Not Available	
Low Dose	72%***	55%	57%***	43%	53%***	39%	54%***	38%	54%***	39%	57%**	39%
Not Low Dose	61%***	56%	50%***	44%	46%***	40%	46%***	39%	47%***	39%	51%***	40%
Asian	70%	64%	59%	49%	63%	45%	59%	45%	57%	46%	Insufficient Sample	
Black	63%***	53%	54%***	42%	49%***	36%	49%***	35%	50%***	35%	56%***	34%
Latinx	61%***	49%	48%***	36%	45%***	32%	44%***	31%	46%***	31%	49%***	33%
White	69%***	60%	59%***	48%	55%***	45%	55%***	44%	56%***	45%	57%**	46%
Men	65%***	53%	55%***	41%	50%***	37%	49%***	35%	50%***	36%	52%***	36%
Women	67%***	58%	55%***	47%	52%***	43%	53%***	42%	55%***	43%	59%***	45%

♈ First-time students registered at their institutions in a fall term and enrolled either full or part time. SSA participants include those who first participated in SSA in summer or fall. Positive outcome includes retained, completed, transferred to 4-year, or joined the STEM workforce. Statistically significant results from quasi-experimental modeling are indicated with asterisks (*p < .05, **p < .01, ***p < .001).

Evidence and Outcomes

SSA students, including Black students, Latinx students, and women, earned STEM degrees and certificates at higher rates than their peers

Overall and student group results

SSA participants were statistically significantly more likely than their peers to earn a STEM degree or certificate from a 2- or 4-year institution at 2, 3, 4, 5, and 6 years after entry, as shown in Table 3.

Across 15 student groups, STEM degree or certificate attainment was statistically significantly higher for SSA participants than for non-participants at multiple time points. This represents improvement compared with previous analyses, where case-managed, white, and Asian SSA participants were not statistically significantly more likely to achieve a STEM degree or certificate.

For STEM-at-entry students, those who participated in SSA earned STEM degrees or certificates at higher rates than those who did not participate.

Spotlight: Critical successes in STEM completion

Results for STEM degrees and certificates were positive and significant for three groups typically underrepresented in STEM:

Black SSA participants earned STEM degrees and certificates at higher rates than their non-SSA peers 2, 3, 4, and 5 years after entry.

Latinx SSA participants earned STEM degrees and certificates at higher rates than their non-SSA peers 3, 4, 5, and 6 years after entry.

Women SSA participants earned STEM degrees and certificates at higher rates than their non-SSA peers 3, 4, 5, and 6 years after entry.

Table 3: Students Earning STEM Degrees and Certificates 2 to 6 Years after Entry
SSA vs. Non-SSA, by Student Group, with Model Results ♈

	2 Years After		3 Years After		4 Years After		5 Years After		6 Years After	
Student Groups	SSA	Non-SSA	SSA	Non-SSA	SSA	Non-SSA	SSA	Non-SSA	SSA	Non-SSA
All Students	6%*	2%	12%**	4%	17%***	6%	21%***	7%	23%***	9%
STEM at Entry	9%*	7%	17%**	11%	23%***	15%	28%***	18%	32%***	20%
Not STEM at Entry	1%*	0%	4%***	1%	6%***	2%	9%***	3%	10%***	4%
SSA Aid	11%***	2%	19%***	4%	25%***	6%	28%***	8%	30%***	9%
SSA Extra Support	7%	2%	13%**	4%	18%***	6%	22%***	7%	24%***	9%
SSA Counseling	9%**	2%	17%***	4%	23%***	6%	28%***	8%	32%***	9%
SSA Case Managed	14%***	3%	26%***	6%	Insufficient Sample		Data Not Available		Data Not Available	
Low Dose	6%	2%	15%***	4%	20%***	6%	22%***	7%	28%***	8%
Not Low Dose	7%***	2%	11%***	4%	14%***	6%	18%***	8%	22%***	9%
Asian	7%	3%	17%*	6%	25%*	9%	28%*	11%	Insufficient Sample	
Black	4%***	1%	10%*	3%	16%***	4%	19%***	6%	24%**	7%
Latinx	4%	2%	10%**	3%	13%***	4%	18%***	5%	21%***	6%
White	7%	3%	13%*	5%	18%*	7%	21%**	9%	23%**	10%
Men	7%	3%	14%**	4%	18%**	6%	22%**	7%	24%**	8%
Women	5%	2%	9%***	4%	15%***	6%	19%***	8%	23%***	9%

♈ First-time students registered at their institutions in a fall term, beginning with Year 3 of the initiative. For 2 Years After, only full-time students are included; all other years include part time and full time. SSA participants include those who first participated in SSA in summer or fall. Statistically significant results from quasi-experimental modeling are indicated with asterisks (*p < .05, **p < .01, ***p < .001).

Conclusion

Rigorous statistical analyses as well as accounts from students and staff indicate that SSA has had a positive impact on student experiences and outcomes and is meeting the need identified by the Commonwealth.

Prior to SSA's launch, Massachusetts leaders identified a pressing and challenging need for a larger and more diverse STEM workforce—one that would match increasing demand and have higher representation of women and people of color. In response to that need, the state funded—and DHE implemented—an ambitious initiative (STEM Starter Academy, or SSA) across the Commonwealth's 15 community colleges.

Since its launch in 2014, SSA has served over 35,000 students. Just over half of these students have been women, and over half have been students of color. Analyses based on data collected through Year 10 of implementation show that SSA participants have achieved positive outcomes and earned STEM degrees and certificates at statistically significantly higher rates than similar non-participating peers. Overall, SSA students are twice as likely as non-SSA students to achieve positive outcomes, and these results have been realized at a per-student cost of approximately $1,250. Importantly, SSA has proven especially successful among STEM-interested women, Black, and Latinx students. Through SSA, Massachusetts has been able to match a need with an initiative that works.

It is worth emphasizing that SSA participants and completers are more diverse than Massachusetts' current STEM workforce. As such, SSA is responding not only to the Commonwealth's current and projected need for an increasing number of STEM workers, but also to its need for a more diverse STEM workforce. It is widely known that a diverse and representative workforce allows for a variety of perspectives, creativity and innovation in the workplace, and the ability to connect to a wider range of consumers, constituents, and communities.

Guided by principles of collaboration, local flexibility, and innovation, the SSA initiative and the individual campus programs have been responsive to evolving student needs. DHE began SSA with a commitment to evidence-based decision making grounded in evaluation of program efficacy and has looked to data and evaluation results to shape the development and refinement of the intervention over time. DHE has consistently positioned equity—specifically racial and gender equity—as the guiding priority for SSA. As the MassReconnect and MassEducate initiatives bring free community college to the Commonwealth, it is reasonable to assume there will be more students who would greatly benefit from the targeted interventions and supports offered by SSA programs.

SSA is supporting growth in the number of STEM degree and certificate holders in Massachusetts at a time when STEM industry employs 21% of the Massachusetts workforce, and the projected growth rate for STEM jobs is more than double the projected rate for job growth overall.[5] The need that inspired SSA more than a decade ago continues to be relevant and urgent today. It is clear that SSA is making its mark as an initiative that coalesces around the Commonwealth's ongoing commitment to and investment in community college, attention to diversity and equity, and support for STEM education and industry success.

End Notes

1. Research literature shows that knowledge of supports and resources, connections with faculty, and confidence and self-efficacy are in turn linked to student achievement and retention, among other positive outcomes. See, e.g., Cuseo, J. (2018). Student–faculty engagement. *New Directions for Teaching and Learning, 2018*(154), 87–97. https://doi.org/10.1002/tl.20294; Devonport, T. J., & Lane, A. M. (2006). Relationships between self-efficacy, coping and student retention. *Social Behavior and Personality: An International Journal, 34*(2), 127–138. https://doi.org/10.2224/sbp.2006.34.2.127

2. Commonwealth Corporation. (n.d.). *STEM brief 2021: See what you can do in STEM.* https://commcorp.org/wp-content/uploads/2021/10/STEM-BRIEF-2021-uploaded.pdf; Funk, C., & Parker, K. (2018, January 9). *Women and men in STEM often at odds over workplace equity*. Pew Research Center. https://www.pewresearch.org/social-trends/2018/01/09/women-and-men-in-stem-often-at-odds-over-workplace-equity/

3. Joining the STEM workforce is not included as a positive outcome in Table 1 due to the limited availability of these data. DHE will continue to explore options for assessing this outcome.

4. For Asian students, results from Years 1, 2, 3, 4, and 5 are positive but not statistically significant.

5. Commonwealth Corporation. (n.d.). *STEM brief 2021: See what you can do in STEM.* https://commcorp.org/wp-content/uploads/2021/10/STEM-BRIEF-2021-uploaded.pdf
According to Commonwealth Corporation 2018–2028 job growth projections based on analysis of Massachusetts Economic Research Department, Executive Office of Labor and Workforce Development, Occupational Projections, STEM occupations will grow at 7.2% versus 3% across all occupations.