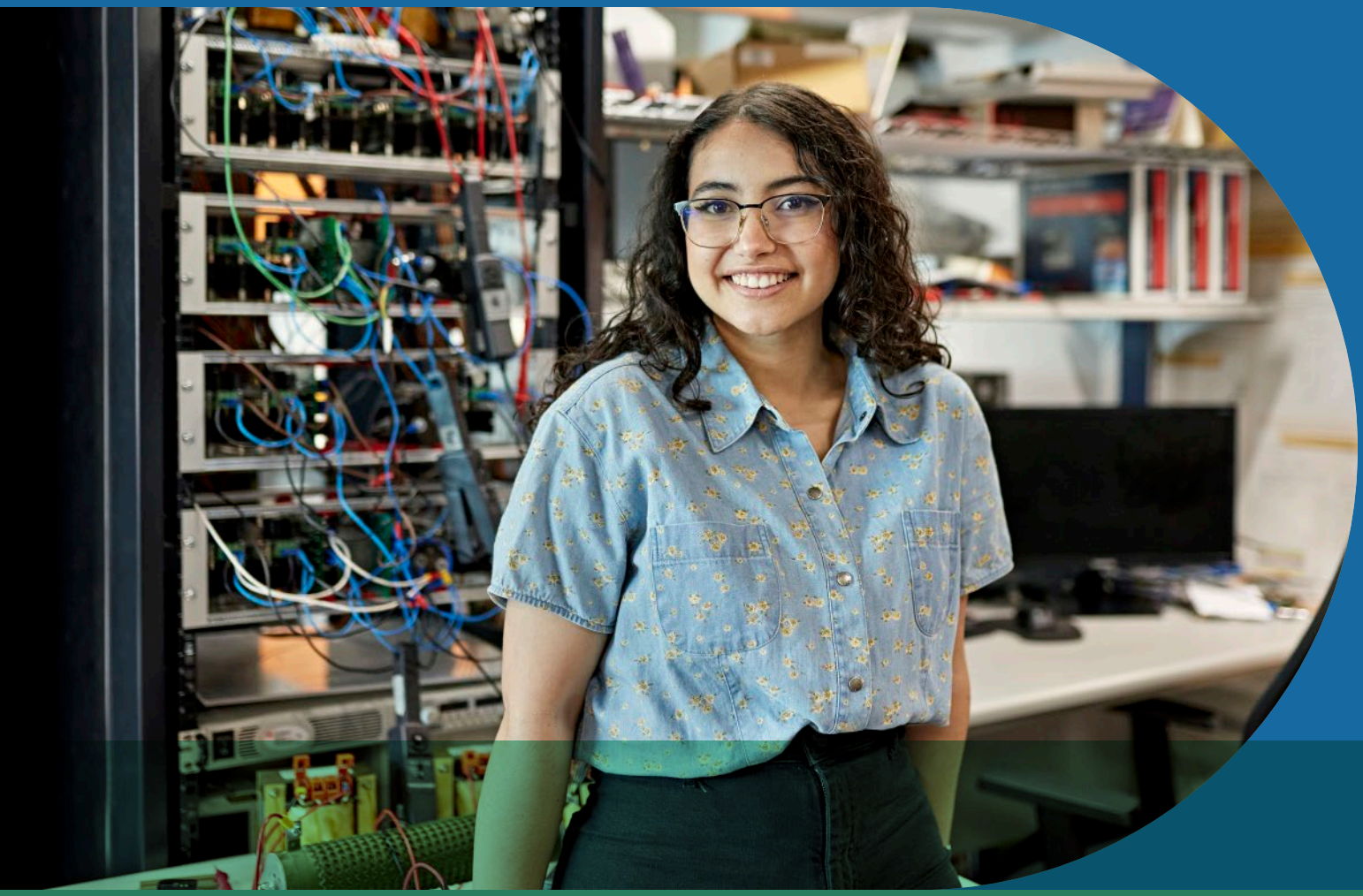
PROGRAM SPOTLIGHT:

# Mathematics, Engineering, Science Achievement Program

*Building a Diverse Pipeline of Students Pursuing a STEM Degree Within California Community Colleges*



THE INSTITUTE FOR COLLEGE ACCESS & SUCCESS

MARCH 2025

# Executive Summary

This report uses a qualitative research design to amplify the voices of science, technology, engineering, and mathematics (STEM) students, practitioners, researchers, and policy advocates across the nation. At the national level, The Institute for College Access and Success (TICAS) gathered insights through two virtual roundtable discussions with 11 STEM equity leaders, including representatives from federal agencies such as the National Science Foundation (NSF), practitioners at historically Black colleges and universities (HBCUs), researchers, and policy advocates. At the state level, TICAS engaged with 41 participants from the Mathematics, Engineering, Science Achievement (MESA) Program, including community college staff, directors, and students from four regions of California. These insights shaped an analysis of community colleges' current role in promoting STEM diversity and highlighted how California's community colleges, through the MESA program, are preparing a diverse pool of candidates for transfer to four-year institutions to pursue baccalaureate degrees in STEM majors. The findings informed the institutional, federal and state policy recommendations in this report, which aim to advance STEM access and success for students affected by social, economic, and educational disadvantages.

# Introduction

STEM fields are pivotal for innovation, driving economic growth and technological advancements worldwide. In the United States, STEM careers are projected to grow by 11 percent from 2020 to 2031, significantly outpacing the overall job growth rate of 8 percent.[1] Furthermore, data from the National Center for Education Statistics show that STEM degree graduates have higher median annual earnings compared to graduates from other fields.[2] However, despite this increasing demand, the representation of students entering and succeeding in STEM disciplines remains uneven, with significant disparities based on gender, race, ethnicity, and socioeconomic status.

Research shows that while many students express interest in STEM, far fewer go on to complete degrees in these fields, with significant disparities across race and gender. These gaps persist in both degree attainment and representation in the STEM workforce. To enhance representation, colleges must prioritize and expand programs that support marginalized students, ensuring they have the resources and opportunities to thrive in these critical fields.[3] As the Pew Research Center notes, addressing these gaps is crucial to ensuring a robust and competitive labor market capable of sustaining economic growth and innovation.[4]

## CALIFORNIA'S MATHEMATICS, ENGINEERING, SCIENCE ACHIEVEMENT (MESA) PROGRAM

Founded in 1970 at Oakland Technical High School, the MESA program has since expanded to middle schools, high schools, community colleges, and four-year universities across California with support from the state and philanthropic foundations.[5] Originally aimed at increasing the number of Black, Hispanic/Latino, and Indigenous students going to and through the STEM pipeline, the program's focus shifted after Proposition 209 (1996) to include all students affected by social, economic, and educational disadvantages. Today, the program's mission remains clear: to ensure all students in California have access to the mentoring, experiences, networks, and other resources they need to earn degrees in calculus-based STEM fields and pursue careers in STEM.[6]

As California continues to address barriers in higher education, the student support strategies embedded in the MESA program provide a framework which produces transfer success, fosters school-to-industry linkages, reduces excessive unit accumulation, and alleviates financial burdens on students.[7] By further investigating and integrating insights from programs like MESA into state-level policies and college practices, colleges can create a more equitable and inclusive STEM landscape in California.

## ROLE OF COMMUNITY COLLEGES IN STEM DIVERSITY NATIONWIDE

Nearly half of all U.S. students attend a community college at some point during their academic journey, making these institutions crucial for implementing pro-STEM interventions. Additionally, community colleges disproportionately serve Black, Hispanic/Latino, and Indigenous students and have a majority female undergraduate population.[8] Community colleges play a central role in fostering STEM diversity by providing critical access, support, and pathways to success in STEM coursework and careers. For many students, these institutions serve as the first opportunity to explore and commit to a STEM trajectory.[9] Research shows that community colleges can enhance educational equity in STEM fields by addressing the unique needs of their diverse student populations.[10]

The true impact of community colleges may be even greater than commonly understood. Traditional metrics often focus on degree completion, overlooking the contributions of STEM transfer pathways and non-credential technical training that are vital to STEM success.[11] Despite their potential, the ability of community colleges to fully support students in STEM fields is constrained by cultural and structural barriers and shrinking state higher education funding.[12] These challenges limit their capacity to expand and sustain their impact, underscoring the need for greater investment and support to maximize their contributions to STEM equity.

## THE CALIFORNIA COMMUNITY COLLEGE SEGMENT OF THE MESA PROGRAM

The California Community College (CCC) system, serving over two million students across 116 colleges, is the largest and most diverse public postsecondary program in the nation. Over 70% of CCC students identify as Black, Latino, Asian, Pacific Islander, Native American, or another racial or ethnic minority group, 65 percent of students are classified as Perkins Economically Disadvantaged (PED) (the metric used as a measure of students' income status based on their receipt of financial aid and other social benefits), 54 percent are female, and 35 percent identify as first-generation students attending college. The CCC MESA program, established in 1991, supports students affected by social, economic, and education disadvantages in STEM fields and operates on 91 campuses of 116 community colleges in California. The program aims to increase transfer rates, improve academic performance, and foster a diverse STEM workforce in collaboration with four-year institutions. It fosters a collaborative learning environment and community among participants by offering academic support and planning, counseling, professional development, career exploration activities, and STEM enrichment opportunities.[13]

Recently, the MESA program has received transformative legislative support and funding increases due to efforts from the MESA Directors Association.[14] Within the 2024–25 state budget, the program increased its budget allocation up to $39.4 million,[15] with award amounts for individual campuses disbursed through a base amount plus a proportional share based on the number of college participants. In 2023, Senate Bill 444 by Senator Josh Newman codified the MESA program into the education code, to provide it stability and require the evaluation necessary to best serve

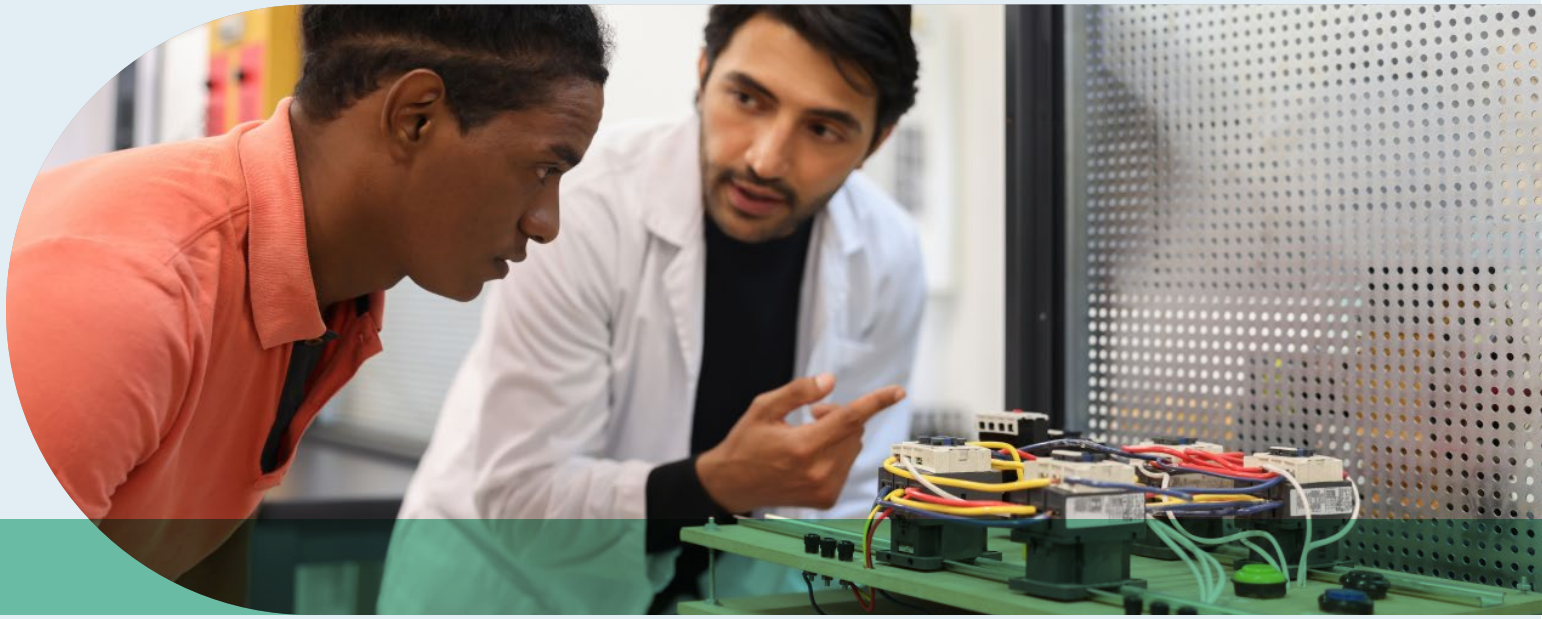
students across the state.[16] The law also requires the Board of Governors for CCC to adopt regulations to ensure the program effectively supports students affected by social, economic, and educational disadvantages pursuing STEM degrees.[17] These efforts have resulted in nearly a tripling of programs,[18] serving more than 5,000 students as of spring 2024.[19]

## NATIONAL DATA ON STEM OUTCOMES

While research indicates that over 80 percent of high school students express interest in STEM, only 16 percent complete a bachelor's degree in these fields. Women and historically underrepresented racial and ethnic groups (Black, Hispanic/Latino, and Indigenous students) face persistent barriers to completion. Women make up 58 percent of the total college population but earn only 34 percent of STEM degrees, with even lower representation in engineering and computer science, where they account for just 22 percent of degrees.[20]

Black and Hispanic/Latino students are also disproportionately underrepresented. Although they account for 14 percent and 19 percent of the U.S. college population, they earn only seven percent and 12 percent of STEM degrees, respectively. These disparities extend to the workforce, where only nine percent of STEM workers are Black, and 15 percent are Hispanic/Latino, highlighting the ongoing exclusion of these communities from STEM careers.[21] Expanding efforts like MESA is essential for strengthening STEM participation, degree attainment, and workforce representation.[22]

According to the National Center for Education Statistics (NCES), U.S. postsecondary institutions conferred 789,264 STEM degrees/certificates in 2021–22, with 56.2 percent going to white students. Men earned significantly more STEM degrees than women (509,064 vs. 280,200), with gender disparities most pronounced at the associate (71%) and certificate (77%) levels.[23] Across all degree types, men earned between 61 percent and 64 percent of STEM degrees at the doctoral, master's, and bachelor's levels.[24]



# Understanding MESA's Impact

To understand both the impact that the MESA program has had on building a diverse STEM pipeline and the broader national STEM landscape, this study employed a qualitative research design centered on focus groups and roundtable discussions. These engagements provided key insights into student and staff experiences, institutional practices, and systemic challenges in STEM education, offering a comprehensive look at both MESA's effectiveness and national trends. *See Appendix for a detailed methodology.*

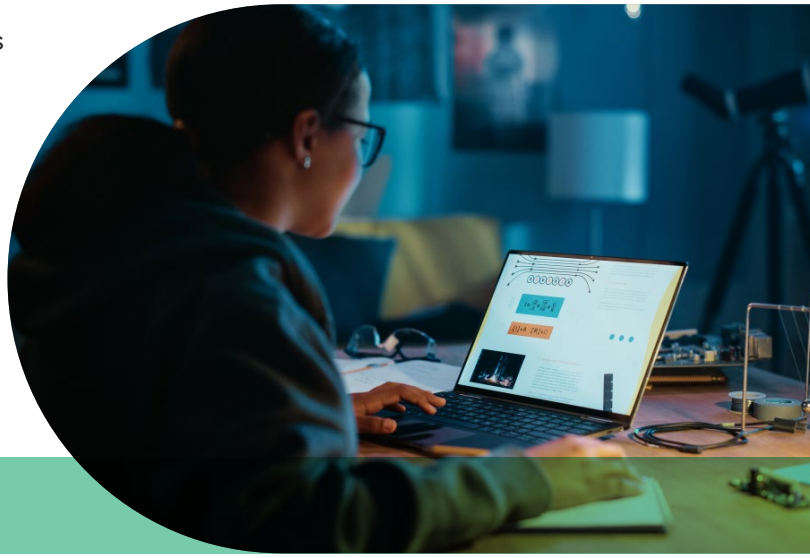
## NATIONAL PERSPECTIVES ON STEM EQUITY AND DIVERSITY

In a series of roundtable conversations, various leaders of STEM equity work across the nation point to several key issues that, if addressed, could amplify two-year institutions' momentum in closing equity gaps for STEM completion.

In these roundtable discussions with STEM equity leaders, several key points emerged:

1. **Missed Potential:** Despite enrolling many underrepresented students and serving as key STEM entry points, community colleges are often overlooked in national STEM completion efforts. Investing in transfer pathways, industry partnerships, and targeted support could unlock their full potential to diversify and strengthen the STEM workforce.
2. **State Support:** States play a critical role in providing infrastructure, funding, and oversight to support community colleges, and coordinate across institutions to enhance transfer pathways.
3. **Sustainability Challenges:** Effective STEM programs often end prematurely due to limited funding and insufficient plans for long-term sustainability.

National leaders discussed the important role states play in providing infrastructure that supports and amplifies two-year institutions' contributions, since all too often, good programs end because of limited funding, or no plans for sustainable funding. Additionally, one person highlighted that two-year institutions not only drive STEM completion at the two-year level, but also boost four-year STEM outcomes through career exposure, curriculum access, and transfer pathways.



> ***We [are] still getting grants, but you know… when the grant disappears, staff disappears, resources disappear, and hopefully the intent is to build for sustainability and that doesn't always happen."***
>
> SENIOR LEADER, COMMUNITY COLLEGE

Collectively, national STEM leaders underscore the need for high-value and high-impact STEM completion programs to have funding to staff and sustain their impact long term, as well as the necessary advocacy from supporters with the political capital to represent their needs at state and federal levels.

## MESA STUDENT DEMOGRAPHICS AND PROGRAM IMPACT

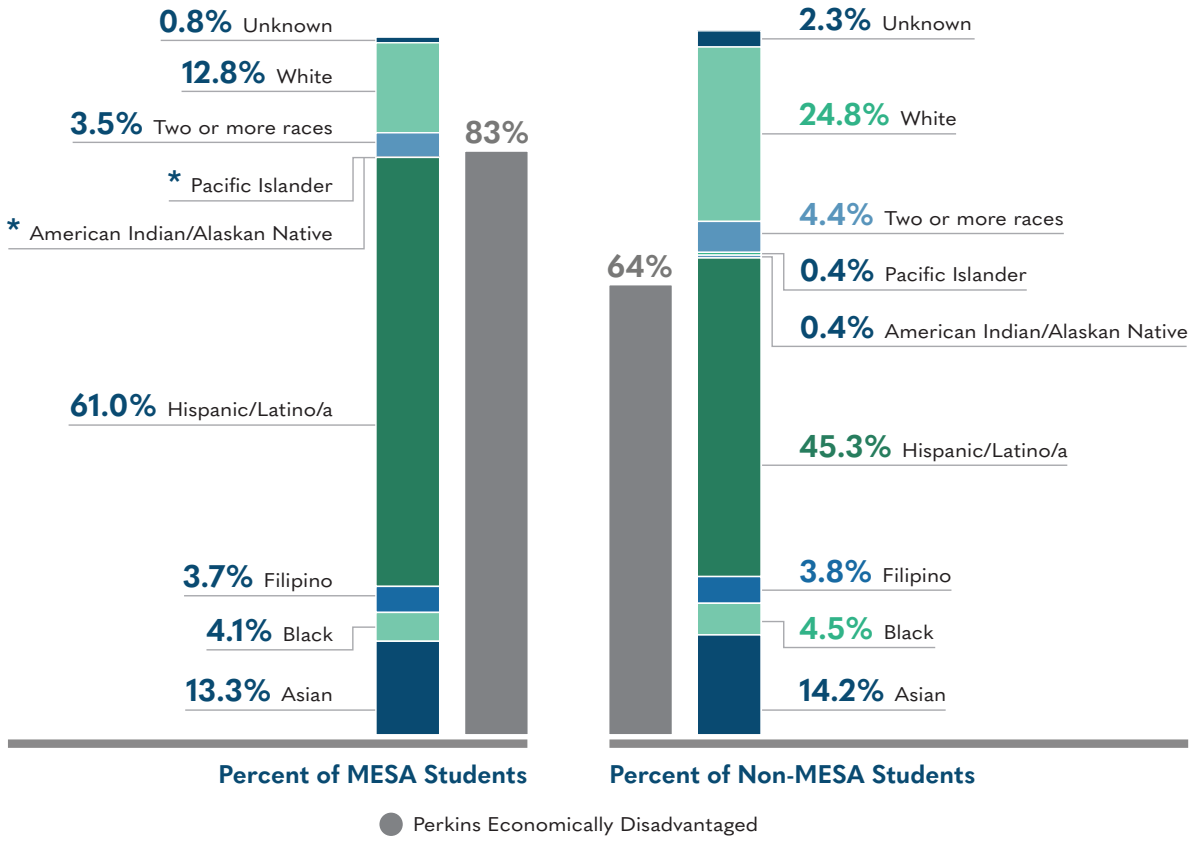
### *How MESA Supports STEM Success: Insights from the 2016–17 Cohort*

To understand the composition of who MESA students are and the impact of the program, TICAS requested six-year cohort-level data from the California Community Colleges Chancellor's Office (CCCCO) beginning in 2016–17 and compared MESA and non-MESA students whose course of study was in STEM. This data indicates that MESA was effectively serving students affected by social, economic, and educational disadvantages, as shown in Figure 1, which highlights the demographic composition of MESA participants compared to non-MESA STEM students. Across the six-year cohort, the gender distribution remained consistent, indicating stable representation of female, male, and unknown gender students over time.

FIGURE 1:

## Race/Ethnicity & Socio-Economic status of MESA and Non-MESA Students

*A higher proportion of MESA participants identified as Hispanic/Latino/a than among non-MESA participants, and a lower proportion of MESA students were White compared to non-MESA participants.*




*Source: Data Request from the CCCCO on a six-year cohort-level data from 2016–17 to 2022–23 looking at MESA students and non-MESA students whose course of study was in STEM. Note: Data for Alaskan Native students and Pacific Islander students in MESA are privacy suppressed due to headcounts of fewer than 10 students.*

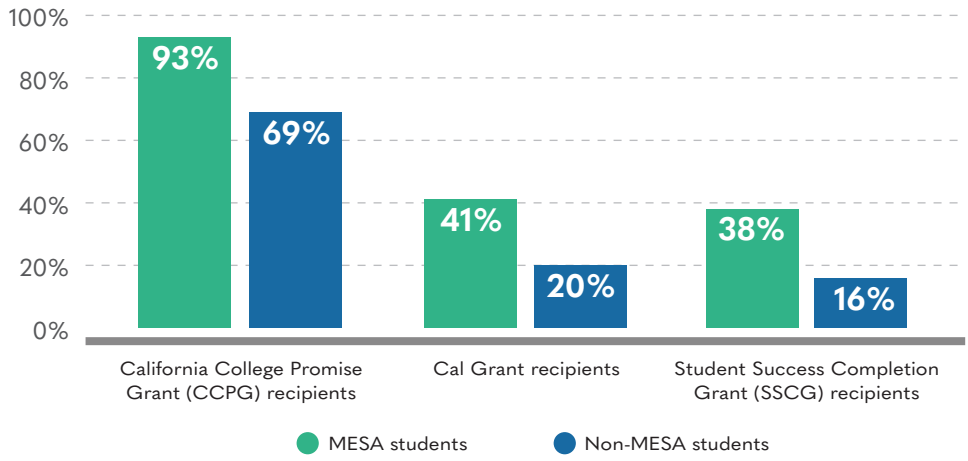
On all financial aid access metrics, shown in Figures 2 and 3, CCCCO data shows that MESA students have a higher proportion of recipients accessing state and federal financial aid such as California College Promise Grant (CCPG), Cal Grants, Student Success Completion Grant (SSCG), and Federal Pell Grants and over a six-year time period MESA students receive more aid dollars than their non-MESA peers.

FIGURE 2 & 3

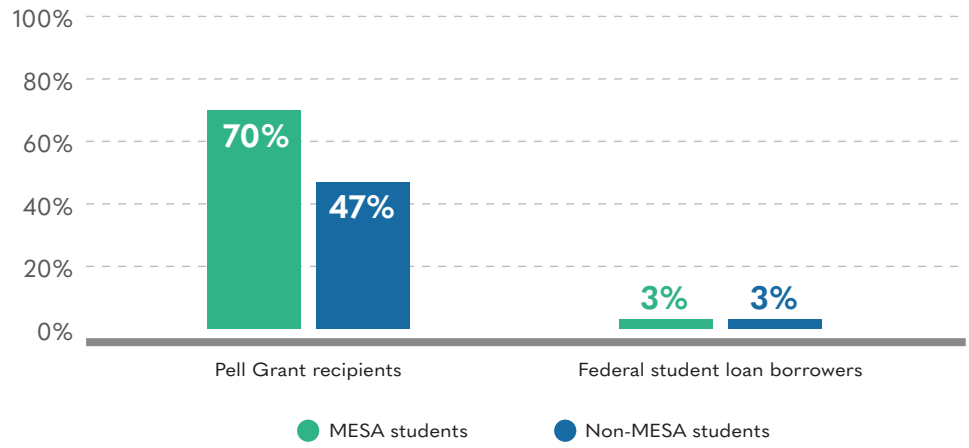
## Access to Financial Aid programs for MESA and Non-MESA Students

*MESA participants access state and federal financial aid programs at higher rates than non-MESA participants.*

### *State Federal Aid Outcomes for MESA Students*




### *Federal Financial Aid Outcomes for MESA Students*




*Source: Data Request from the CCCCO on a six-year cohort-level data from 2016–17 to 2022–23 looking at MESA students and non-MESA students whose course of study was in STEM.*

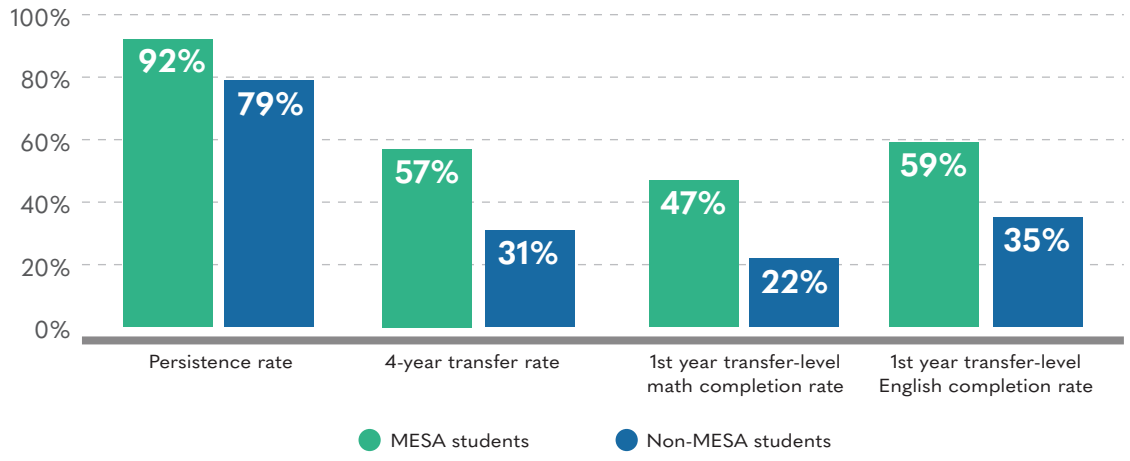
FIGURE 4 & 5

## Key Academic Outcomes for MESA and Non-MESA Students

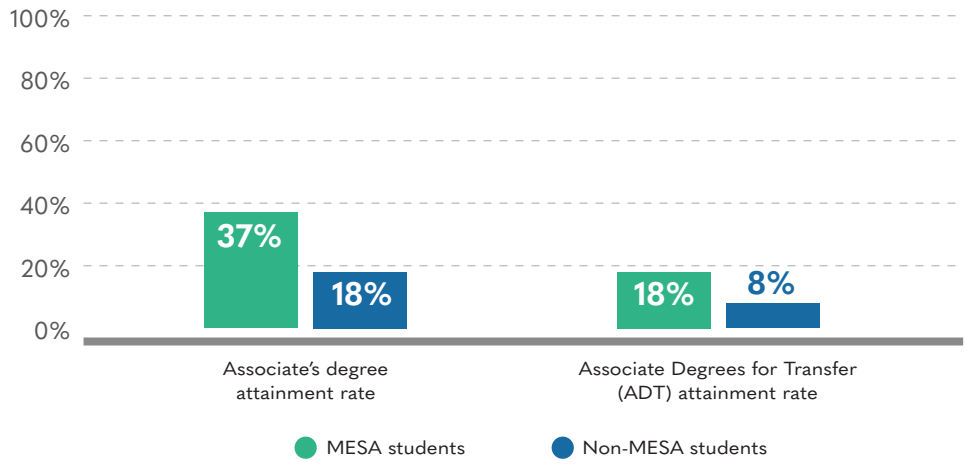
***MESA participants have better academic outcome results than non-MESA participants.***

On all academic outcomes, shown in Figures 4 and 5, CCCCO data shows higher rates of success for students participating in MESA than non-MESA STEM students. Within their first year, MESA students generally completed more units, on average, than their non-MESA counterparts and they hit key milestones such as passing a transfer-level math and English at higher rates. Additionally, MESA students persisted, transferred to four-year institutions, and attained associate degrees or associate degrees for Transfer (ADTs) at higher rates than non-MESA students.

### *Persistence and Transfer Outcomes for MESA Students*




### *Degree Attainment Outcomes for MESA Students*




*Source: Data Request from the CCCCO on a six-year cohort-level data from 2016–17 to 2022–23 looking at MESA students and non-MESA students whose course of study was in STEM.*

MESA has proven highly effective in supporting students in STEM, helping them persist and succeed at significantly higher rates than their non-MESA peers. However, equity gaps remain, presenting opportunities to further strengthen support for students from diverse racial and ethnic backgrounds.

For example, while Hispanic MESA students transfer to four-year institutions at the lowest rate (51%), this is still more than double the transfer rate of their non-MESA Hispanic peers (23.3%). Similarly, Black MESA students complete first-year transfer-level math at the lowest rate (22%), yet this is also double the completion rate of non-MESA Black students (10.2%). Additionally, low-income MESA students demonstrate stronger early momentum, a key predictor of long-term academic success, by completing more units in their first year than their non-MESA counterparts (20.8 vs. 15.9 units).

These disparities underscore both MESA's effectiveness with doubling student outcomes and the need for continued, targeted efforts to close equity gaps. The CCC MESA program remains essential in diversifying the STEM pipeline and expanding opportunities for students who might otherwise face significant barriers in STEM education and careers.

## MESA'S IMPACT THROUGH STUDENT AND STAFF PERSPECTIVES

TICAS engaged with 41 participants, including staff, directors, and students from four specific regions of California, Superior California, North Coast, Central Coast, and San Diego-Imperial, to explore how participation in the program has influenced students' educational journeys. These discussions shed light on the program's impact and highlighted opportunities for greater equity in STEM education.

In these focus groups with MESA students, several key themes emerged:

- **Empowered Educational Journeys:** Students emphasized how MESA transformed their academic experiences by providing critical support that increased their confidence, persistence, and preparation for transferring to four-year institutions and STEM careers. Many credited the program with strengthening their academic identities and fostering a sense of belonging in STEM.
- **The Value of Mentorship:** Access to relatable and accessible mentors was repeatedly highlighted as a key factor in student success. Students emphasized that having advisors who understood the unique challenges of their students helped them navigate academic pathways and overcome both academic and social barriers.

> ***"MESA gave me a community. Without it, I wouldn't have known where to turn for help, both academically and personally."***
>
> MESA STUDENT PARTICIPANT

- **Building a Strong Pipeline to STEM Careers:** MESA's structured academic support, mentorship, and career readiness programs provide a direct pipeline to STEM careers. Students noted that exposure to professional networks and industry partners strengthened their career preparation and aspirations. However, some expressed concerns about the continuity of support when transitioning to four-year institutions, which could impact their long-term career success.
- **Navigating Challenges and Addressing Resource Gaps:** Despite MESA's impact, students shared persistent challenges in accessing additional resources, particularly in transfer pathways and graduate school preparation. They called for more comprehensive institutional and state-level support to ensure sustained financial aid, mentorship, and career development opportunities.

> ***"I wish more institutions invested in partnerships like this; it makes a real difference, but it's not enough if it doesn't continue when we transfer."***
>
> MESA STUDENT PARTICIPANT

## IN FOCUS GROUPS WITH MESA STAFF AND ADMINISTRATORS, SEVERAL KEY THEMES EMERGED:

- **Facilitating Student Success:** Staff highlighted MESA's holistic approach to student support, emphasizing that its success lies in addressing both academic and personal needs. They noted that strong mentorship, community-building, and academic support were key factors in student retention and completion.
- **The Importance of Advocacy and Program Sustainability:** MESA staff emphasized the need for stronger advocacy at institutional, state, and federal levels to sustain and expand the program. They called for dedicated, recurring funding to ensure MESA's continued success in supporting STEM students, including resources for staffing, infrastructure, and strategic partnerships with four-year institutions.
- **State and Institutional Roles in Strengthening MESA's Impact:** Staff identified opportunities to enhance transfer pathways, expand industry partnerships, and implement systemic mentorship initiatives to strengthen MESA's role in STEM completion. They stressed that cross-institutional collaboration is essential to ensuring students continue receiving support beyond community college.

> *Balances are important, making sure that students are passing, yes, but also making sure that there are social elements."*
>
> MESA ADMINISTRATOR

> *We build momentum with these programs, but when the funding ends, the staff and resources disappear. Sustainability has to be a priority."*
>
> SENIOR MESA STAFF MEMBER

> *MESA is not actually allowed at their school to give out scholarships to students. We're allowed to give out stipends. So the way we're working around the stipends is we're heavily pushing our students to our internships and externships, whether it be during a summer or during the semester. Over the summer, we collaborate with our work study department."*
>
> MESA STAFF MEMBER

> *“Whatever question you may have, internships, scholarships, transfer questions, MESA really helped me become more confident in myself to take that step forward.”*
>
> MESA STUDENT

# Recommendations

Collectively, these insights reinforce the need for sustained support for programs like MESA to ensure their impact reaches even further. To amplify these outcomes and ensure underserved and underrepresented students in STEM not only access opportunities but thrive, targeted federal and state actions are essential. **The following recommendations outline key steps to build on MESA's success and advance equity in STEM education.**

## INSTITUTIONAL RECOMMENDATIONS

1. **Strengthen Industry Partnerships:** Expand collaborations with STEM-focused companies and industry partners to offer students hands-on learning opportunities, paid internships, and professional networking.
2. **Enhance Comprehensive Support Services:** Partner with on-campus offices to address the unique challenges faced by underrepresented STEM students. Provide access to financial aid resources, childcare and mental health and wellness services, particularly to those balancing academic, work, and family responsibilities.

## FEDERAL RECOMMENDATIONS

1. **Sustainable Funding for STEM Programs:** Establish long-term federal grants and funding streams to ensure the continuity and expansion of impactful STEM pipeline programs like MESA. Sustained investment in programs like MESA strengthen workforce development, increase college completion rates, and enhance economic competitiveness.
2. **Support for Community Colleges:** Increase funding to community colleges to improve STEM transfer pathways, infrastructure, and faculty development.
3. **Expand Paid Mentorship and Internship Opportunities:** Launch federally funded mentorship and internship programs tailored to women anad historically underrepresented racial and ethnic groups in STEM to create strong career pipelines.

## STATE RECOMMENDATIONS

1. **Secure Dedicated State-Level Funding:** Advocate for sustained and reliable state funding to ensure all eligible community colleges, particularly rural and underfunded colleges, can establish or expand MESA programs.
2. **Develop Transfer-Specific Scholarships:** Work with four-year institutions to create targeted scholarships that leverage their institutional financial aid, supporting MESA students as they transition to STEM programs at universities.
3. **Leverage Data and Evaluation Tools:** Implement robust tracking systems to monitor students' academic and career progress after transferring. Use this data to evaluate the effectiveness of specific interventions or pathways to scale successful practices.

> ***"Continue providing funding for students to get involved in STEM participation. When we have financial burdens, it is hard to be involved while trying to successfully pass STEM classes...Without grants this is not possible."***
>
> MESA STUDENT

# Conclusion

The MESA program exemplifies California's efforts to address equity and access in the STEM pipeline. For over four decades, it has addressed barriers that often hinder the progress of underserved and underrepresented students in STEM, both academically and professionally. Through targeted academic support, mentorship, and professional development opportunities, MESA empowers students to navigate the STEM transfer pipeline and achieve success in four-year institutions and beyond.

Programs like MESA, aligned with TICAS' CASS principles, exemplify effective strategies such as mentorship, academic resources, and career pathways, serving as a model for advancing STEM equity nationwide. By addressing barriers faced by underserved and underrepresented students, MESA not only transforms educational outcomes but also offers a replicable framework for tackling STEM equity challenges across the country. Investing in MESA is both a commitment to student success and a strategic effort to strengthen California's STEM workforce, providing valuable lessons for other community colleges and states striving to build a more inclusive and diverse STEM pipeline.

# Acknowledgements

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# Appendix

## METHODOLOGY

This study employed a qualitative research design to evaluate the impact of the Mathematics, Engineering, Science Achievement (MESA) program in California Community Colleges (CCC). Data was collected through focus groups and roundtable discussions with MESA students and staff, as well as researchers, policy advocates, administrators, and STEM leaders from across the country. Additionally, through a data agreement, CCCCO provided aggregated, college-level cohort data from the 2016–2017 cohort, comparing MESA students and non-MESA STEM students. This dataset included demographics, financial aid distribution, and academic outcomes. This data was used to complement qualitative findings, providing a comprehensive view of student success factors and program impact. These engagements and datasets offered valuable insights into MESA's effectiveness in supporting underrepresented students in STEM. Participants were recruited through a combination of institutional outreach and professional networks.

- **National Level:** To explore state and federal policy conditions that support women and historically underrepresented racial and ethnic groups (Black, Hispanic/Latino, and Indigenous students) in STEM fields, TICAS convened two virtual roundtable discussions with 11 STEM equity leaders, including practitioners, researchers, and policy advocates from Historically Black Colleges and Universities (HBCUs), Minority-Serving Institutions (MSIs), federal agencies (such as the National Science Foundation), and STEM policy organizations. Participants were invited based on their expertise in broadening participation in STEM pathways at the community college level. Discussions focused on state programs and policies that increase access and success for women and students of color in STEM, as well as opportunities to scale and sustain these efforts through federal and state policy interventions.
- **State-Level (California):** A series of virtual focus groups with 41 MESA students and staff explored the program's impact across four California regions: Superior California, North Coast, Central Coast, and San Diego-Imperial. MESA staff were invited based on their leadership roles within the program, while students, all of which were current CCC MESA participants, were identified through their campus directors and peer referrals. Outreach was conducted to MESA programs statewide based on the MESA Program Directors Contact List maintained by the California Community Colleges.[25] However, only institutions from Superior California, North Coast, Central Coast, and San Diego-Imperial responded and participated in the focus groups. While no specific diversity criteria were set for student participation, institutional data from CCCCO confirms that MESA serves a racially and ethnically diverse student population.

A thematic analysis was conducted to identify key trends in STEM persistence, student support structures, and policy implications. This approach provided a comprehensive understanding of MESA's impact on student success and highlighted areas where additional support could strengthen STEM pathways nationwide.

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