

BOARD # 451: S-STEM: Building and supporting a robust transfer pipeline in Computer Science, Mathematics, and Physics

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S-STEM: Building and Supporting a Robust Transfer Pipeline in Computer Science, Mathematics, and Physics

Abstract

The Computer Science, Mathematics, and Physics (CSMP) scholarship program is a partnership between Central Connecticut State University (CCSU), Manchester Community College (MCC), and Tunxis Community College (TCC) aimed at supporting low-income, high-achieving STEM students. Focused on diversity and inclusion, the program emphasizes a streamlined transfer pipeline, academic and social support through a cohort model, and career development opportunities. Grounded in the Integrated Model of Student Persistence (IMSP), the program addresses key factors for student success, including academic performance, social integration, and career goal commitment. Through strong institutional collaboration, the program ensures seamless credit transfers, targeted advising, and robust community-building initiatives, helping students transition smoothly into four-year degree programs. Cohort-based learning fosters peer support and mentorship, reducing challenges for transfer students. Career-focused programming, including internships and industry engagement, prepares scholars for competitive STEM careers. A comprehensive assessment framework tracks academic progress, institutional commitment, and career readiness, enabling continuous program improvement. By recruiting underrepresented groups and sharing outcomes with the community, the program promotes equity and serves as a model for similar initiatives. The CSMP program demonstrates the power of collaboration in advancing STEM education and creating a diverse, skilled workforce.

Introduction

The Computer Science, Mathematics, and Physics (CSMP) scholarship program is a transformative initiative developed collaboratively by Central Connecticut State University (CCSU), Manchester Community College (MCC), and Tunxis Community College (TCC). Focused on addressing financial, academic, and social barriers faced by low-income, academically talented students, the program emphasizes pathways into and through STEM disciplines such as computer science, mathematics, and physics. The initiative is dedicated to supporting underrepresented groups, including women, minorities, and first-generation college students, with the goal of increasing retention, graduation rates, and career readiness. This partnership creates a comprehensive pipeline from MCC and TCC to CCSU, blending academic preparation, social integration, and professional development into a holistic support system for student success [1, 2].

Program Goals and Objectives

The CSMP program was developed to address critical challenges in STEM education, particularly for low-income students who face significant barriers to entry and completion. At its heart, the program seeks to remove financial obstacles by providing scholarships that cover tuition and related costs, allowing students to focus on their studies. Beyond financial aid, the program delivers academic support, mentorship, and a structured cohort model that helps students build lasting connections with peers and faculty. By fostering a sense of belonging and

providing access to career-related experiences, the program prepares students for success both during and after their college years.

A key aspect of the program is its commitment to supporting transfer students from MCC and TCC and integrating them into the CCSU cohort. These students, who may encounter unique challenges when transitioning to a four-year institution, benefit from tailored support, including academic advising, credit transfer assistance, and social integration activities. The program's ultimate goal is to ensure that scholars graduate with STEM degrees within four years, ready to contribute to a growing and diverse workforce [3].

The Integrated Model of Student Persistence (IMSP) Framework

The CSMP program is grounded in the Integrated Model of Student Persistence (IMSP), a comprehensive framework that informs the scholarship program's design and implementation [4]. IMSP identifies several key factors influencing student success, including pre-college characteristics, social and institutional integration, academic performance, and goal commitment. The program applies this framework by offering targeted interventions designed to address each factor.

Pre-college characteristics, such as high school GPA and test scores, help the program identify students who would benefit most from its support. Social and institutional integration is achieved through the cohort model, mentorship, and engagement in co-curricular activities such as workshops and seminars. Academic performance is monitored through regular evaluations, enabling the program to intervene early when students face challenges. Goal commitment, including a clear focus on career aspirations, is reinforced through internships, industry connections, and career counseling. By addressing these interconnected factors, the CSMP program ensures that students receive the support they need to persist and thrive.

Strengthening the Transfer Pipeline

One of the program's most innovative features is its emphasis on the transfer pipeline between MCC, TCC, and CCSU. Recognizing that many students begin their academic journeys at community colleges, the program works to create a seamless transition to four-year degree programs. This collaboration ensures that students experience a coherent educational pathway, with aligned curricula and transparent credit transfer processes. Academic advisors at MCC and TCC work closely with their counterparts at CCSU to help students plan their coursework, ensuring they meet all prerequisites for transfer.

Once at CCSU, transfer students are integrated into existing CSMP cohorts, which immediately connect them with peers and faculty. This social integration is critical for students adapting to a new academic environment, as it helps them build networks of support and fosters a sense of belonging. The program also addresses challenges specific to transfer students, such as feelings of isolation and difficulties navigating a larger institution. These efforts not only enhance retention but also position transfer students for academic and professional success.

Cohort Model and Social Integration

The cohort model is a cornerstone of the CSMP program, designed to foster a strong sense of community among scholars. Students are grouped into sub-cohorts that progress through the program together, participating in shared activities that encourage collaboration and mutual support. These activities include seminars, workshops, guest lectures, and field trips, all of which are designed to enhance both academic and social development [5].

The cohort model serves multiple purposes. It helps students develop lasting relationships with their peers, which can alleviate feelings of isolation and stress. It also provides a platform for peer mentoring, where students can share knowledge and experiences. Faculty engagement with cohorts further strengthens the sense of community, as professors act not only as educators but also as mentors and advisors. This integrated approach to social and academic development is particularly beneficial for transfer students, who might otherwise struggle to connect with their new academic environment [6, 7].

Professional Development and Career Readiness

In addition to its academic and social components, the CSMP program places a strong emphasis on professional development. Recognizing the importance of preparing students for the workforce, the program offers a range of career-related activities designed to build skills and provide exposure to industry practices. Scholars participate in internships, industry visits, and networking events that allow them to connect with professionals in their fields of interest.

Guest speakers and panels featuring industry leaders provide insights into current trends and challenges in STEM fields, helping students align their academic pursuits with market demands. Career counseling sessions guide students in developing resumes, preparing for interviews, and navigating job searches. These efforts are supported by an advisory board comprising faculty, industry representatives, and alumni, who provide additional guidance and open doors to career opportunities. By combining academic excellence with career readiness, the program ensures that graduates are well-equipped to succeed in a competitive job market.

Commitment to Diversity and Inclusion

The CSMP program is deeply committed to fostering diversity and inclusion within STEM fields. It actively recruits students from underrepresented groups, including women, minorities, and first-generation college students, aiming to address historical disparities in STEM education and careers. This focus on diversity enriches the learning environment, as students from varied backgrounds bring unique perspectives and experiences to their studies.

Outreach efforts extend to high schools and community organizations, encouraging students to consider STEM careers and highlighting the opportunities available through the CSMP program. Scholars are also encouraged to serve as ambassadors, inspiring others in their communities to pursue higher education. By promoting equity and inclusion, the program not only benefits its participants but also contributes to broader societal goals of diversity and representation in STEM fields.

Institutional Collaboration

The success of the CSMP program is rooted in the strong collaboration between CCSU, MCC, and TCC. Each institution brings unique strengths to the partnership. MCC and TCC serve as gateways for students from diverse backgrounds, offering accessible education and preparing them for the transition to a four-year institution. CCSU builds on this foundation by providing rigorous STEM programs and integrating transfer students into its academic and social communities.

Faculty and staff from all three institutions work closely to ensure a seamless student experience, from initial enrollment at MCC or TCC to graduation from CCSU. This collaboration includes shared advising resources, joint curriculum development, and coordinated support services. By working together, the institutions create a unified pathway that maximizes student success and demonstrates the power of partnerships in achieving educational equity.

Assessment and Evaluation

The CSMP program employs a rigorous assessment framework to monitor its effectiveness and guide continuous improvement. Academic performance is tracked through metrics such as grade point averages, course completion rates, and four-year graduation rates. These quantitative measures are complemented by qualitative feedback gathered through focus groups, surveys, and mentor reports.

Institutional commitment, a key factor in student success, is assessed using established survey tools that measure students' sense of belonging and engagement. These assessments help identify areas where students may need additional support, allowing the program to implement timely interventions. Data on program outcomes, such as career placements and graduate school enrollments, further illustrate the program's impact and inform its ongoing development.

Dissemination and Broader Impacts

The results and best practices of the CSMP program are widely disseminated to benefit the broader higher education community. Presentations at conferences such as those hosted by the Consortium for Computing in Small Colleges (CCSC) and the ACM Special Interest Group for Computer Science Education (SIGCSE) share insights with educators and policymakers. Peer-reviewed publications contribute to academic discourse on STEM education, particularly in the context of community college transfers and underrepresented groups.

The program also serves as a model for other institutions, demonstrating how collaboration and targeted interventions can improve outcomes for low-income, academically talented students. By supporting a diverse pipeline of STEM graduates, the CSMP program addresses workforce needs and promotes social mobility, contributing to a more equitable and innovative society.

Program Outcomes

As a result of this program, a total of 118 students have been supported by the program, of which 77 (65%) students have graduated and 19 (16%) are currently nearing the completion of their degrees. This includes 36 students who were supported at the community college level and then transferred to CCSU to complete their 4-year degree. During its lifetime, the program supported 43 (36%) female and 44 (37%) minority students.

Conclusion

The CSMP scholarship program exemplifies a transformative approach to STEM education. Through its innovative partnership between CCSU, MCC, and TCC, it creates a seamless pathway for students from diverse backgrounds to achieve academic and professional success. Its emphasis on cohort building, professional development, and diversity sets a new standard for educational equity and excellence. By addressing financial, academic, and social barriers, the program not only empowers its participants but also serves as a model for institutions nationwide, shaping the future of STEM education and workforce development.

Acknowledgements

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