STEM SERIES

Underserved Community College Students and the Complexity of STEM Transfer

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Community college students aspiring to transfer into STEM majors at a four-year institution face a complicated and nuanced admissions process. In some cases, students may be admitted to the four-year transfer institution but face additional requirements to enter a STEM major. This study of community college underserved students of color, women, and first-generation students in a program aimed to help them succeed in STEM finds gaps in knowledge around transfer and STEM specific major requirements. These findings point to the need to build more knowledge about STEM-major transfer requirements and processes among community college students as well as advisors and STEM faculty so they can better inform students of transfer pathways. This research also points to the need to strengthen transfer partnerships between two-year and four-year institutions in support of community college students who aspire to a STEM baccalaureate degree.

INTRODUCTION

Community colleges have become a large and critical component of the U.S. system of higher education and stand to play a substantial role in improving the production of STEM graduates. Whereas African Americans and Latinos are just as likely as White students to enter college with the intention of a STEM degree, they are much less likely to graduate with one (National Science Foundation, 2017). Because of their diverse student population (Ingels et al., 2014; Ma & Baum, 2016) and history of educating STEM professionals (Van Noy & Zeidenberg, 2014), community colleges provide access to STEM pathways for underserved student groups, including women, African American, Latinx, Native American, and first-generation college students. Beyond access, the potential role of community colleges to contribute to the production of STEM degrees and professionals from these groups is critical.

The issue of whether students in community colleges with STEM aspirations successfully complete STEM baccalaureate majors is mostly unexplored in the literature, in some part due to the difficulty of obtaining data that would identify these aspirants and follow them through to baccalaureate completion (Bahr, McNaughtan, Oster & Gross, 2017). What little we do know, however, paints a concerning picture for STEM aspirants beginning at community colleges (Bahr, McNaughtan, Oster & Gross, 2017; Wang, 2015). Underserved students may experience difficulty navigating transfer in the face of complex university admission requirements, especially when students encounter a relative dearth of information on competitive STEM majors (National Academies of Sciences, Engineering, and Medicine, 2016). Further complicating students' experiences transferring into any major including STEM is the variation in partnerships between community colleges and

universities that can facilitate or impede transfer (Yeh & Wetzstein, 2018).

THE STUDY

This data note summarizes major findings from a study aimed at examining what underserved community college students know about the transfer process and how confident they are in their ability to transfer into a STEM major at the university level. This research centers on one program, the Math Engineering Science Achievement (MESA) Community College Program (MCCP) in Washington and California. The program is representative of a number of emerging interventions that are springing up nationally to support underserved community college STEM students. MESA-MCCP currently operates in 35 California community colleges, 12 Washington community and technical colleges (CTCs), and many other community colleges in nine states. The MESA Community College Program provides high school graduates with transitional support as they enter college. Seventy percent of MCCP students nationwide are underrepresented minority or first-generation college students. MCCP students receive leadership training, tutoring, mentoring, and academic counseling.

Much previous research has shown that a suite of interventions is important to community college STEM student success (see, for example, Chang, Sharkness, Hurtado & Newman, 2014; Hurtado, Cabrera, Lin, Arellano & Espinosa, 2009; Espinosa, 2011). Building on these studies to examine the influence that MESA-MCCP has on student success, Meza, Dorsey and Harvey-Buschel (2017) conducted a mixed methods study that showed MESA-MCCP students accumulate significantly more college level credits and STEM credits, and graduate with a transfer degree at significantly higher rates than a group of transfer STEM students not participating in MESA-MCCP. The study also gathered data from 89 student participants in nine focus groups who attributed program success to positive and affirming community, career and academic support, and professional development activities with diverse mentors, as well as targeted academic advising. These promising findings for the program were also complemented with concerns, with some students mentioning a lack of specific information on transfer and access to transfer advisors on university campuses. They also offered frustrations at the vast array of differing requirements, deadlines, and knowledge needed to navigate STEM transfer.

Noting the importance of these quantitative and qualitative findings, especially students' concerns about various aspects of transfer, this author decided to conduct additional research involving a larger number of student participants in MESA-MCCP. A questionnaire was administered to MESA-MCCP participants to gather data on what they knew about transfer, how transfer was working for them, and what plans they were making to transfer.

Looking specifically at Washington State, very few MESA-MCCP students or other students in the CTC system in Washington graduate with a STEM- specific degree that prepares them to transfer into competitive STEM majors at the university level. In total, only 1,822 students graduated with a STEM-specific transfer degree in all 34 of Washington State's CTCs in the 2017-18 academic year. This number of graduates represents only 9% of the total transfer degrees awarded in the state. This modest number of transfer students attaining STEM baccalaureate degrees is concerning given that by 2030, 67% of Washington family-wage jobs are expected to be associated with STEM-related fields that require a postsecondary credential (Washington STEM, n.d.).

Given the increasingly competitive environment for admission to STEM majors (Myers-Twitchell et al., 2018), it is increasingly imperative that first-generation, underserved students of color, and women who aspire to participate in these programs get the information and opportunities they need to successfully apply to STEM programs, transfer credits, and navigate their way into and through a STEM major to obtain the bachelor's degree.

RESEARCH QUESTIONS

What do underserved transfer students participating in MESA-MCCP, a community college-focused program supporting student success in STEM, say they know about STEM transfer?

How confident are MESA-MCCP students in their knowledge of the requirements and process to transfer into a STEM major at a university?

DATA AND METHODS

The data for this exploratory study come from 76 surveys collected from 83 students attending a MESA leadership retreat that serves underserved students of color, first-generation students, and women in STEM. A short application form was required of all students who applied to attend the retreat. The large majority of students who applied were selected to attend. Student participants in this study were drawn from 12 CTCs in Washington and three community colleges in California. A slight majority (54%) of students were female and the group was comprised of a racially diverse mix of students. Thirteen identified as Black/African American, seven as Asian, ten as White, forty as Latinx, and one as Pacific Islander. Five did not report race/ethnicity. All survey respondents responded that they intended to transfer to a baccalaureate program in a STEM-related field, with 57 percent of students intending to transfer into a science major and all others intending to transfer into either engineering or mathematics.

Knowing MESA is an optional program for underserved students, it is important to understand that the students attending the retreat as well as the sub-set of the retreat participants completing the survey may be better informed and prepared for college, more motivated to succeed in college, and show higher self-efficacy than other students.

The questionnaire asked mostly open-ended questions encouraging students to write about their knowledge of transfer but also asked them to rate their knowledge of transfer requirements and STEM-specific requirements for their preferred major. The questionnaire items used a 5-point or 4-point scale ranging from no knowledge/not confident to very confident. For example, one question asked the students how confident they are in their knowledge of the transfer process. The questionnaire also asked the students if they had spoken with a transfer advisor at their target four-year college(s).

FINDINGS

Students who responded to the questionnaire who were in their first year at a community college reported that they know relatively little about the requirements to transfer into a STEM major. Of all 30 students who fit this profile, 90% rated themselves either "not at all" (50%) or "somewhat" (50%) knowledgeable about the transfer process. Only about one-third of these students were confident in their knowledge of transfer requirements for their preferred major. When asked what they knew specifically about transferring in STEM, many of these students wrote about needing a high GPA or a mentor, especially in their preferred major. They also had specific universities in mind for transfer, but they knew little about transfer processes or requirements for those institutions.

Comparing first-year students to students having more experience at the community college, students in their second or third year (n=46) were much more confident than first-year students. Two-thirds of these experienced students rated themselves very confident about their knowledge of the transfer process, and nearly the same percentage (60%) were very confident about their knowledge of requirements for their preferred STEM major. The majority of these students were planning to apply to at least two universities. In California, it was not uncommon for students to mention applying for transfer to a University of California (UC) institution, a California State University (CSU) institution, and a private institution, adding complexity to the transfer process. These findings suggest that knowledge of transfer grows for students from the first to second year and this growth is

necessary as students need to master sophisticated knowledge of requirements associated with transfer to the various four-year institutions that they are considering attending.

Despite the students' confidence, not one respondent described their STEM major as competitive for admission or demonstrated knowledge of requirements for applying to a STEM major. For example, MESA students who reside in Washington mentioned applying to "capacity constrained" majors in engineering at the University of Washington (UW), Seattle but it is unclear whether they knew of the additional rigorous admission requirements beyond general university admission that they would have to meet to be admitted to an engineering department. It seems clear from the data that many of these students, as well as other students, had not spoken with a transfer representative at their preferred university about these nuanced admissions requirements, possibly not even knowing they exist.

Overall, about half of all respondents (n=39) reported they had spoken with a representative at a transfer institution where they had applied or were interested in applying, with most of these students being in their second or third year attending community college. When they did meet with a representative, most students said these interactions were brief, with many happening at transfer fairs or advising fairs that took place on their community college campus.

DISCUSSION

This study provides a snapshot of transfer in STEM majors from the perspective of underserved student populations. The survey design enabled the researchers to dig deeper than a previous focus-group study to uncover student knowledge of STEM transfer, transfer resources, and community college-to-university partnerships. Though the study is small scale and conducted with a select group of underserved students attending a MESA retreat, it provides insights into student plans to attain a STEM-specific transfer degree. The responses also raise concerns about the clarity of transfer pathways in STEM majors that lead to high-paying, in-demand STEM careers.

Even though students in their second and third year had a much clearer sense of transfer admission requirements, they did not mention the competitive direct admission or capacity-constrained majors that universities such as University of Washington at Seattle employ. Few students mentioned asking in-depth questions of university representatives that might help them understand the competitive culture, requirements, and processes for transfer and admission to a STEM major. This may leave students unable to meet requirements for their preferred major, even if they are able to successfully transfer into their preferred university.

These findings point to the need to build more knowledge about STEM major transfer requirements and processes among community college students as well as advisors and STEM faculty so they can better inform students of transfer pathways. This research also points to the need to strengthen transfer partnerships between two-year and four-year institutions in support of community college STEM students who aspire to complete a baccalaureate degree in a STEM major but need more information and support to successfully reach their goal.

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