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To cite this article: Dimitra J. Smith, Jessica L. Spott, Raegan Higgins & Jon McNaughtan (2021): Beyond Articulation Agreements: Fostering Success for Community College Transfer Students in STEM, *Community College Journal of Research and Practice*, DOI: [10.1080/10668926.2021.1961923](https://doi.org/10.1080/10668926.2021.1961923)

To link to this article: <https://doi.org/10.1080/10668926.2021.1961923>



Published online: 12 Aug 2021.



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EXCHANGE



Beyond Articulation Agreements: Fostering Success for Community College Transfer Students in STEM

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ABSTRACT

Using data from a south-west alliance between two-year colleges and four-year universities, this study provides insight into the needed resources at partner institutions to promote the successful transfer and retention for minoritized students in STEM. The study includes responses from over 500 students who were engaged in alliance-related activities over the course of several years and insight from over 200 STEM faculty and staff. Findings indicated that transfer students seek support beyond institutional articulation agreements and that faculty strive to provide additional support. Specifically, we find that student needs include knowledgeable advising and mentoring, lab equipment and study space, and opportunities to connect with STEM professionals in industry and academia. Faculty shared that institutional support should be provided to develop a writing center, increase faculty diversity, and establish diversity training for faculty.

Transfer student success in STEM

Two recent articles published by *Inside Higher Ed* highlighted that the development of institutional articulation agreements is not enough to promote student success. John Fink posed the following question in his article: “Rather than asking, *Are students transfer-ready? We should be asking, Is our college ready for transfer* (para 1)?” Lavinson (2021) agreed saying, “Transfer students need more support, clarity, and guidance than what this narrow legal document can offer (para 1).” Both articles highlight the lack of clarity between community colleges and universities regarding transfer student success and question if they are prepared to respond to the needs of transfer students.

Though the articles discussed all students, we posit that this need is even higher among transfer students seeking STEM degrees due to the highly structured course sequencing and increasing demand for applied technology experiences (Packard, 2011). According to Jackson et al. (2013), transfer students in STEM may perceive four-year campuses as unwelcoming, unsupportive, and their peers as overly competitive and unfriendly. Providing context on the importance of more robust transition support, Reyes (2011) found that transfer students are more likely to excel and graduate if they can survive the challenges faced in their first year at a four-year institution. Additional barriers, such as a chilly climate and feelings of isolation, have been found among students of color (Cabay et al., 2018). These environments may be created due to their small numbers and preconceptions that faculty and peers may have of transfer students (Jackson et al., 2013; Reyes, 2011).

Highlighting the experiences and needed resources of faculty, staff, and administrators who work directly with transfer students in STEM is also essential. Tobolowsky and Cox (2012) found that even

when university administrators and staff seek to understand the experiences of transfer students and recognize that their issues and needs are not being met by the institution, they were unsure how to assist the transfer students. In ensuring the success of transfer students in STEM, the needs and resources of individuals who advise, guide, teach, and provide learning environments for students should also be considered. To better understand the needs of transfer students of color and relevant faculty, staff, and administrators, this study gathered insight from 513 students and 179 STEM faculty, staff, and administrators, across all partner institutions, about successfully navigating transfer pathways for STEM students of color.

When seeking to foster positive environments for transfer students of color in STEM, it is essential to capture the needs of actively engaged students and the needs of involved faculty, staff, and administrators to ensure that the needs of all involved are met. According to Fink (2021), resources and programs are often established without input from impacted individuals, thus leading to under-used resources and negatively outcomes for students. Therefore, the purpose of this study is to outline some of the needs *beyond articulation agreements* of both STEM students of color; and involved faculty, staff, and administrators. Identifying these needs is essential so that enhancements can be made regarding the transfer process of STEM undergraduate students from the community college to a four-year university. While the needs of transfer students and faculty, staff, and administrators may be similar to those of all students and institutional agents, this study focused specifically on the needs of transfer students in STEM and faculty, staff, and administrators who work directly with this population.

Research design

Two overarching research questions guide this study: 1) *What do students of color perceive as needs beyond articulation agreements to be successful in STEM transfer and retention?*; and 2) *What do STEM faculty, staff, and administrators perceive as needs beyond articulation agreements to be successful in STEM transfer and retention?* To address the research questions, data were used from a National Science Foundation-funded study designed to identify the necessary resources at partner institutions within a southwest alliance. The alliance included four community colleges and two-four year institutions that serve a geographically large and demographically diverse region. In this multi-year project, questionnaires were used to capture the needs of transfer students of color in STEM. This study focused on defining and categorizing STEM student and faculty, staff, and administrator-identified resources necessary to successfully transfer from the community college to the 4-year institution. Focusing on effective ways to positively impact STEM-student transfer experiences can affect persistence, retention, and graduation. Additionally, this study showed different perspectives of students, faculty, staff, and administrators regarding needed transfer resources. Student questionnaires were used to identify institutional resources needed to positively impact successful student transition and the project was conducted from September 2017 to March 2019.

Students were sent an e-mail invitation that included a link to the questionnaire with informed consent via Qualtrics which consisted of 37 questions, including Likert scale questions and one open-ended question. The open-ended question asked the participants to provide resources that his/her/ their institution lacked that he/she/they felt would be beneficial to transfer students in STEM. Anonymous data was collected via digital questionnaires in January and February 2018. A total of 513 students from the six partner institutions participated. Two hundred and seventy-two (53%) of the students who completed the questionnaire were of Hispanic, Latino, or Spanish origin. Of the participants, 258 (50%) self-identified as White, 109 (21%) as Black or African American, 23 (4%) as American Indian or Alaska Native, two as Native Hawaiian or Other Pacific Islander, and 90 (18%) as Other. Most participants (approx. 75%) were 18–25 years old.

Additionally, an e-mail invitation was sent to all faculty, staff, and administrators who worked directly with STEM majors at the six partner institutions. This invitation also included a link to a questionnaire with informed consent. The questionnaire consisted of 34 questions, including an

open-ended question about resources the institution lacks that would benefit African American or Hispanic students in a STEM-related area. Of 179 participants, 103 (48%) identified as White. Less than 25% of the participants identified as Black or African American (38) or Asian (10). Three identified as American Indian or Alaska Native, and 25 (14%) participants identified as Other or did not report. The data were analyzed by the Office of Planning & Assessment (OPA) at the lead institution. After exhaustively reading all open-ended qualitative responses, the responses were coded into NVIVO 12. Responses were loosely categorized into 1) student requests/needs and 2) student recruitment into STEM fields. After this loose categorization, the 10 specific themes became apparent. Each theme was assigned a color code in NVIVO.

Findings

This study was designed to explore students' and faculty, staff, and administrators' perspectives regarding institutional resources needed to assist in the successful transfer and degree completion of transfer students of color in STEM. The identified resources are not in any particular order. The first research question asked, *“What do students of color perceive as needs beyond articulation agreements to be successful in STEM transfer and retention?”* Among 2-year and 4-year STEM students, the responses on the questionnaires suggest that several institutional resources, such as STEM advisors, clubs, scholarships, and tutoring, are needed. The two most common resources among both groups were STEM tutoring and STEM advisors. See **Table 1** to view the resources identified among 2-year and 4-year students of color.

The second research question asked, *“What do STEM faculty, staff, and administrators perceive as needs beyond articulation agreements to be successful in STEM transfer and retention?”* Among the 2-year and 4-year faculty, staff, and administrators, the responses on the questionnaire suggest that several institutional resources, such as advisors, scholarships, and tutoring, are needed. However, faculty, staff, and administrators at the 2-year also indicated counseling as

Table 1. Transfer student-identified resources.

Student of color-identified resources for transfer students in STEM					
4-year			2-year		
STEM advisors	56	24.89%	STEM advisors	93	26.20%
STEM clubs	51	22.67%	STEM club	79	22.25%
STEM scholarships	49	21.78%	STEM scholarships	70	19.72%
STEM tutoring	63	28.00%	STEM tutoring	91	25.63%
Other	6	2.66%	Other	22	6.20%
Total	225	100.00%	Total	355	100%

*Participants were able to select more than one resource, so the number of resources will be higher than the number of participants.

Table 2. Faculty, staff, and administrator-identified resources.

Faculty, staff and administrator-identified resources for transfer students in STEM					
4-year			2-year		
Advisors	27	18.24%	Advisors	85	17.28%
Clubs	26	17.57%	Club	78	15.85%
Counseling	23	15.54%	Counseling	79	16.06%
Scholarships	27	18.24%	Scholarships	79	16.06%
Success centers	16	10.81%	Success centers	66	13.41%
Tutoring	27	18.24%	Tutoring	86	17.48%
Other	2	1.35%	Other	19	3.86%
Total	148	100.00%	Total	492	100.00%

*Participants were able to select more than one resource, so the number of resources will be higher than the number of participants.

a top resource. Table 2 highlights the resources identified among 2-year and 4-year faculty staff and administrators.

In this study, the students and administrators had similar thoughts regarding the resources needed to assist in the success of transfer students of color. Both students and faculty, staff, and administrators identified STEM advisors and tutoring as necessary resources. Additionally, faculty, staff, and administrators also identified scholarships and counseling as essential resources for transfer students of color in STEM.

Implications for practice and recommendations

The findings of this study offer three recommendations for 2-year community colleges and 4-year institutions regarding responding to the needs of community college transfer students of color in STEM: *Recommendation 1*: Ensure advisors are knowledgeable in academics and the transfer process. Advisors play an essential role in the success of all students by providing academic and curriculum guidance (Jackson (2013a); Packard & Jeffers, 2013). Providing professional development opportunities for advisors that include information on the transfer process, majors, and disciplines will ensure that students are on the right pathway and prepared for transfer (Lopez & Jones, 2017). *Recommendation 2*: Provide resources that focus on tutoring in STEM content. Jackson (2013) highlights resources that focus on tutoring and emotional well-being as key in providing transfer students balance in their experiences. Additionally, tutoring and supplemental instruction in math and science have been identified as key for preparing students and retaining students in STEM-related pathways (Zhang, 2019). Scheduled tutoring has been noted as more beneficial (Russ, 2015). *Recommendation 3*: Provide research and scholarship opportunities for students. Establishing funded research programs, scholarships, and internships for students allows students the chance to learn more about STEM career pathways. This increases transfer student capital, which is highlighted throughout the literature as essential (Lukszo & Hayes, 2020; Starobin et al., 2016). As institutions continue to focus on transfer student success in STEM, considering resources beyond articulation agreements is possible through institutional resources that encourage connection and relationships among peers, leadership within the institution, knowledge about their STEM discipline and workforce preparation.

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