Policy and Program Leaders' Lenses: Enhancing Educational Transitions and Success for Engineering Transfer Students (Work in Progress)

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Abstract

This Work in Progress study explores strategies to support historically marginalized engineering students transitioning from community colleges to four-year institutions. The transfer process presents systemic challenges, requiring leadership from policy and program leaders to foster institutional collaboration. Utilizing the collective impact framework, this study examines perspectives from seven transfer program leaders who participated in structured discussions during a two-day convening in May 2024. Key findings highlight the importance of academic preparation, articulation agreements, financial aid, summer bridge programs, and industry partnerships in facilitating smoother transitions. This study offers actionable insights for policymakers and educators seeking to improve transfer pathways in engineering education.

Introduction

The transfer pathway from community colleges to four-year institutions is essential for expanding STEM career access and meeting workforce demands. However, barriers such as inadequate advising [1], [2], misaligned curricula [2], [3] and limited support programs [4] disproportionately affect historically marginalized students, including women, underserved students of color, and low-income learners [5], [6], [7].

Community colleges provide an affordable entry point, yet many students struggle with progression into advanced coursework [5], [8]. Policy and program leaders play a key role in mitigating these barriers through policy development, institutional partnerships, and strategic initiatives [9]. Despite their impact, little research explores how policy and program leaders think about achieving transfer objectives, particularly in STEM disciplines like engineering.

This study addresses this gap using the collective impact framework [10], [11], [12] which promotes cross-sector collaboration through shared goals and coordinated actions to tackle systemic challenges. Utilizing data from a two-day convening of stakeholders from Minority-Serving Institutions (MSIs), community colleges, nonprofit organizations, and state higher education offices, we examine policy and program leaders' perspectives on enhancing engineering transfer pathways. The central research question is: "What perspectives do program and policy leaders have on addressing barriers and enhancing transfer pathways for engineering students transitioning from community colleges to four-year minority serving institutions?"

Literature Review

Overview of Transfer Pathways: The engineering transfer pathway from community colleges to four-year institutions is crucial for expanding access to STEM careers and addressing workforce demands [13]. Community colleges enroll nearly half of all U.S. college students and serve as key access points for historically marginalized groups [5], [14], [15]. Despite the potential of well-designed transfer pathways to bridge equity gaps in engineering [16], [17], persistent hurdles remain, including complex university transfer applications, post-admission attrition ("transfer melt"), and credit transfer difficulties [18].

Challenges in Transfer Pathways: Barriers to successful engineering transfer include inadequate advising, curriculum misalignment, and financial constraints [19]. Academic advising is often inconsistent, while mismatched curricula create additional challenges [20], [21]. Financial challenges disproportionately impact historically marginalized students [4], [7] while insufficient articulation agreements and limited faculty support compound attrition rates [22], [23].

Transfer students often experience "transfer shock," characterized by GPA declines post-transfer [24], [25]. On average, students lose 43% of credits during transfer [26], [27], while first-generation students and students of color encounter additional challenges that impact persistence and belonging [28], [29], [30], [31].

Policies and Programs that Facilitate Transfer: Several innovative models exist to support transfer students. ADVANCE, a collaboration between Northern Virginia Community College and George Mason University, incorporates dedicated transfer coaches, peer mentorship, and engagement opportunities [32]. STEM Core provides a cohort-based approach ensuring community college students are calculus-ready, on track to transfer, and have access to research or internships [33]. Such cohort-based approaches improve retention and transfer rates, particularly for low-income and first-generation students [34], [35].

Enhanced digital tools and articulation agreements serve as critical resources for streamlining transfer processes [20], [35], [36]. However, most existing research focuses on student-level outcomes and institutional interventions rather than the perspectives of program and policy leaders who design and sustain these transfer efforts. This study addresses that gap by elevating the collective insights of leaders engaged in improving engineering transfer pathways, particularly for historically marginalized students. It builds on previous work using the collective impact framework to illuminate how these leaders envision and enact systemic collaboration, policy change, and programmatic strategies to improve engineering transfer pathways. By centering their voices, this study offers a fresh and underexplored lens to inform scalable and equity-driven practices in engineering education.

Theoretical Framework

This study employs the collective impact framework [10], [11] to examine institutional collaboration in supporting engineering transfer students. The framework provides a structured, cross-sector approach to addressing complex social challenges through five key conditions: (1) a common agenda, (2) shared measurement systems, (3) mutually reinforcing activities, (4) continuous communication, and (5) backbone support organizations.

Application to This Study: The common agenda ensures alignment among stakeholders toward improving transfer pathways for historically marginalized engineering students [11], [37]. By identifying shared objectives, institutions can collectively address systemic barriers [37], [38].

A shared measurement system enables stakeholders to track progress and assess effective strategies [11], [37]. This study synthesizes qualitative insights from stakeholder discussions to develop actionable recommendations for improving transfer outcomes.

Continuous communication fosters transparency and trust, ensuring coordinated efforts across institutions [10]. The federally funded project serves as the backbone infrastructure, providing organizational support to facilitate cross-institutional engagement and sustain momentum in transfer policy initiatives.

By integrating Collective Impact, this study examines how policy and program leaders shape more equitable engineering transfer pathways, emphasizing structured collaboration to foster systemic change and promote inclusivity in engineering education.

Methodology and Methods

This study employs Action Research, a participatory approach that emphasizes iterative collaboration and problem-solving to address systemic challenges [39], [40]. The research was conducted during Phase 2 of a federally funded project focused on optimizing engineering transfer pathways from community colleges to minority serving institutions. Data were collected through participatory observations during a two-day in-person convening involving seven policy and program leaders from community colleges, four-year institutions, nonprofit organizations, and state education offices. Table 1 outlines activities aligned with the Collective Impact framework, while Table 2 presents the characteristics of participating leaders.

Table 1. Activities Aligned with the Collective Impact Framework

Collective Impact Framework (Five Elements)	Activities in the Convening
Common Agenda	Creating the common agenda: Optimizing engineering student pathways from community colleges to minority serving institutions.
Shared Measurement	Identifying indicators that impact engineering student pathways. Participants outlined four key indicators they wanted to advocate for continued support: Engineering readiness, math progression/completion, college readiness, and full course load readiness. During the breakout sessions, participants discussed: 1) the stories behind the indicators; 2) what would work to impact these indicators positively; 3) the consideration of the next steps.
Continuous Communication	The participants comprised a Policy Action Network Group (ANG). The following online Policy ANG meetings were planned for Fall 2024 and Spring 2025.
Backbone Support Organization	Our research team is in partnership with Najera Consulting Group. One research team member is the Chair of the Policy ANG. One participant is the Co-chair of the Policy ANG. The Chair and Co-chair will collaborate to facilitate the following online meetings in Fall 2024 and Spring 2025.
Mutually Reinforcing Activities	We anticipate mutually reinforcing activities in the next phase of the research project.

Table 2. Policy and Program Leaders' Characteristics

Participant Pseudonym	Position	Institution Type	Institution Location
Leader A	Assistant Vice President, Enrollment Management and Services	Public, Hispanic-Serving Institution (HSI)	Southeastern region of the US
Leader B	Project Consultant	Public, Historically Black College and University (HBCU)	South Atlantic region of the US
Leader C	Program Officer and Emeritus Professor (two different organizations)	Non-profit organization; Private, Research University	Midwest (non-profit); Northern region of the East Coast
Leader D	Assistant Vice Chancellor for Academic Affairs	Public, HBCU	Gulf coast
Leader E	Program Director	Non-profit organization	Mid-Atlantic region of the US
Leader F	Director of Academic Affairs	Government-run Organization	Mid-Atlantic region of the US
Leader G	Education Policy Analyst	Government-run Organization	Mid-Atlantic region of the US

Data collection methods included field notes documenting key insights and thematic patterns, summaries of structured activities, summaries from participants' presentations, and reflective memos detailing interactions and emergent themes. These multiple sources helped triangulate the data and ensure validity.

We employed thematic analysis [41], [42] to systematically identify recurring ideas, practices, and challenges through open coding, grouping codes into broader themes aligned with research objectives and collective impact principles, and integrating findings into actionable recommendations. The iterative cycles inherent in Action Research informed our analysis, allowing continuous refinement based on emergent data.

The study adheres to ethical research standards, ensuring informed consent, participant confidentiality, and IRB approval.

Findings

This study provides insights into the collective perspectives of program and policy leaders on improving transfer pathways for historically marginalized engineering students. The following themes emerged from our analysis:

Academic Preparation and Course Alignment*:* Participants emphasized the need for structured academic initiatives, including:

- Strengthening math curricula through faculty collaboration

- Developing joint faculty task forces to align course content
- Implementing early intervention models, such as targeted bridge programs
- Ensuring full course load readiness for timely graduation
- Preparing students adequately for immediate engagement with advanced engineering coursework

Articulation Agreements and Transfer Navigation*:* To address inconsistencies in articulation agreements that lead to credit loss, participants recommended:

- Establishing statewide articulation frameworks for uniformity in credit transfers
- Enhancing automated transfer advising tools with real-time updates
- Strengthening faculty-to-faculty dialogue to refine course transferability policies
- Creating clear information about transfer pathways with detailed agreements
- Aligning articulation agreements with curriculum changes

Financial Support and Sustainability*:* To address financial barriers, participants identified key solutions:

- Expanding industry-sponsored scholarships, stipends, and internships
- Increasing work-study opportunities in STEM fields
- Advocating for state-level policy changes for transfer student financial aid
- Addressing students' multiple commitments between work and school

Cohort-Based Support Models and Mentorship*:* Participants highlighted the impact of cohort-based models in fostering belonging among transfer students through:

- Peer mentorship programs with successful transfer students guiding new entrants
- Transfer-specific living-learning communities that integrate academic and social support
- Faculty mentorship initiatives tailored to transfer student experiences

Industry Partnerships and Experiential Learning*:* For workforce readiness, participants proposed:

- Strengthening industry-academic collaborations for internship opportunities
- Creating transfer student-focused career pipelines connecting students with STEM employers
- Partnering with engineering firms to develop hands-on training modules

System Navigation and Student Confidence Building*:* To address the lack of institutional knowledge, participants suggested:

- Establishing mandatory transfer-specific orientation sessions
- Expanding digital navigation platforms with comprehensive transfer guides
- Hosting regular advising workshops focused on academic and financial resources
- Encouraging the use of campus counseling services for understanding the higher education system

Discussion

Our findings align with two key elements of the collective impact framework: common agenda and continuous communication. When examined alongside existing literature, several insights emerge.

The results reinforce previous research on systemic barriers in engineering transfer, particularly regarding advising, curriculum misalignment, and financial constraints [19], [20], [21]. However, participant responses indicate these challenges are widespread across diverse institutions, suggesting the need for broader, cross-institutional approaches. While programs like ADVANCE [32] and the Texas A&M Engineering Academies Program [43] show promise, they typically operate at a local level between a limited number of campuses rather than at state or regional scales. This limitation is particularly significant for HBCU-community college partnerships, which often face greater funding constraints than larger universities [44].

The emphasis on full-course loads upon transfer warrants critical examination, as it may reflect an institutional bias against post-traditional students [45]. Minichiello [46] notes that four-year engineering programs often characterize post-traditional transfer students, who tend to be older, work more hours off-campus, and enroll part-time, in deficit-based terms. This suggests that policymakers' collective actions may inadvertently reinforce biases favoring traditional learners.

Finally, our findings highlight the importance of connecting transfer students with industry opportunities. While programs like STEM Core [33] integrate internship experiences, most transfer research focuses primarily on academic preparation and articulation agreements. Our study suggests that comprehensive transfer support is essential to balancing academic readiness, institutional partnerships, and professional development.

The convergence of policy leaders around common concerns, from system navigation challenges to course alignment issues, established a "common agenda" central to the collective impact framework. Through our approach to action research, we facilitated "continuous communication" by engaging participants in collaborative discussions rather than traditional question-and-answer sessions. Future research will explore how this foundation supports other collective impact elements, including mutually reinforcing activities and shared measurement metrics.

Conclusion

Improving engineering transfer outcomes requires a multi-pronged approach with input from diverse stakeholders. This project demonstrates the importance of engaging two- and four-year institution stakeholders to enhance transfer pathways. The collective impact framework provides a valuable lens for understanding how different actors can collaborate toward shared goals.

Future work will explore discussions that this research team facilitated with these and other stakeholders, including staff and faculty members at participating community colleges and four-year minority-serving institutions, following this May 2024 meeting. We aim to examine how participants utilized collective impact principles to re-examine and improve the engineering transfer process, with particular attention to historically marginalized students' needs and experiences.

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