

## **Board 368: Regional Assets, Factors, and Strategies Supporting Engineering Pre-Transfer Pathways**

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Kristin Frady is an Assistant Professor at Clemson University jointly appointed between the Educational and Organizational Leadership Development and Engineering and Science Education Departments. Her research focuses on innovations in workforce development at educational and career transitions. The context of her research emphasizes three primary areas specifically focusing on two-year college and secondary STEM and career education, educational innovations, and the middle skill workforce. Dr. Frady is or has served as Principal Investigator, Co-Principal Investigator, or Senior Personnel on six National Science Foundation, two Department of Labor, one Economic Development Agency, four state level, and three private foundation grants totaling \$5,955,928. Also, previously as Faculty Director for Clemson University Center for Workforce Development and the National Science Foundation Advanced Technological Education Center for Aviation and Automotive Technological Education using Virtual E-Schools (CA2VES), Dr. Frady led a team in the development of digital learning tools to expand technician education capacity creating virtual reality tools, advanced e-learning modules, and iBooks which have been utilized in secondary and post-secondary educational environments across the United States.

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## **Regional Assets, Factors, and Strategies Supporting Engineering Pre-Transfer Pathways**

Two-year colleges play a vital role in educating and awarding advanced credentials to America's future scientists and technicians. The research supported by this National Science Foundation (NSF) Faculty Early Career Development Program (CAREER) award emphasizes the importance of and expands understanding of the role that two-year colleges play in the engineering education and career pipeline. Yet, racial and location inequity in vertical transfer highlights a lack of access to life-changing educational opportunities [1, 2]. This research focuses on identifying unique geographic and cultural assets to make pre-transfer engineering students, from a variety of backgrounds, locations, and opportunities, more successful. This research is intended to support increasing the number and preparedness of transfer students. This educational research aims to enhance inclusion and participation in engineering and the development of a more innovative and inclusive technical workforce.

This project aims to broaden participation by improving access to engineering education and baccalaureate degree programs for underrepresented minority, low-income, first-generation, and nontraditional students. Increased transfer pathways and educational innovations specifically designed for marginalized communities can improve transfer outcomes and positively impact college affordability for students from communities not previously well served. This research is distinct from other transfer student research in its combined focus on geographic and cultural assets and needs, the inclusion of multi-institutional data, pre-transfer student focus, data disaggregation by subpopulations, and disciplinary focus on engineering. This research will also inform institutional supports, pathways, and resources needed for increased transfer student capital, stimulate the interaction of researchers and practitioners with policymakers and the public, and expand stakeholder capacity to support and engage diverse populations in STEM education through new partnerships.

In the first year, this research has focused on gathering data in a mixed methods study to create new knowledge to increase engineering transfer numbers and preparedness more broadly through investigating the geographic and cultural assets of transfer intending two-year college students. The research is informed by Laanan's theory of transfer student capital and examines core constructs of transfer student capital [3, 4]. The research questions for the research portion of this project are:

RQ1: What are assets, factors, and strategies that enable access for two-year college students to engineering transfer pathways?

RQ2: Do assets, factors, and strategies vary in magnitude and/or presence across student demographics, locations, institutions, or intention to transfer?

Too often, prior research on transfer students especially those who are from underrepresented backgrounds, presents and discusses students from deficit based perspective which is focused on the limitations and hinderances of students [5]. In this type of research, the students' strengths and assets are overlooked. An assets-based approach focuses on strengths stemming from diversity in thought, culture, community and focuses on valuing the myriad of

characteristics and experiences that students bring to the educational environment. This approach can unlock student potential through focusing on conducting strengths-based research focusing on student talents and assets. Inclusion of an assets-based approach in being increasingly included in engineering education [6]. Given that the research in this project focuses on students from a variety of diverse backgrounds and experiences, setting intention on honoring the strengths and assets of the students, communities, and two-year colleges through an assets-based approach has been first and leading priority. Within the context of this research, in year one, this has influenced the training of the graduate research assistant, the development of interview protocols and survey instruments, working to develop partnerships and datasets, and even emphasis on emerging dissemination in conference papers and evaluation and annual reports.

Next, given its strong integration of and use with many forms of capital including human capital, social and culture capital, experiential capital, and even community and cultural wealth, transfer student capital was selected to provide the lens and theoretical framework guiding the study [3, 4]. This framework is well aligned and was intentionally selected because of its ability to “shift the lens” from a deficit-based perspective to an asset approach in this research [5]. To increase deep knowledge of the transfer student capital framework within the context of engineering and STEM education, a systematic literature review was conducted. In total, 149 articles were found from across seven large academic databases and were screened and reduced to 44 articles used to answer questions of how the framework is being used, major characteristics, and how it can impact and contribute to transfer student outcomes in engineering and STEM education. This article is currently under review, but major themes revealed more granular level understanding of definitions in the engineering context, constructs of the framework, types of research being conducted, and gaps in research to be pursued. This review of literature also served to reinforce the strength of the framework and the importance of maintaining an assets-based perspective and approach throughout this CAREER project research.

Finally, during this first year, datasets were established, and data collection has begun. Data collection has emerged from three primary sources. The first source of data comes from secondary document collection of resources, supports, transfer program information and other related documentary evidence from partnering institutions (one four-year university and three two-year colleges). The next source of data is focusing on collecting interviews with nationally renowned transfer experts and programs to collect perspectives from experts, influencers, and programs across the United States who are engaged in transfer student research and programs. The third source of data is from collecting survey responses from students at four different institutions who have either successfully transferred, intended to transfer, or who are interested in transferring in an engineering or engineering-related field of study. The survey was constructed from three research validated instruments. The Community and Two-Year College student survey developed in Preparing the Engineer of 2020 (EEC 0550608) [7] and Engineering Transfer Survey developed in Diversifying Transfer Student Pathways (EEC 1428502) [8] were included in the survey to provide questions specifically focused on engineering transfer pathways and engineering specific transfer issues. The Moser Transfer Student Questionnaire (M-TSQ) [9] is an adaptation of the broadly used Laanan-Transfer Students’ Questionnaire (L-TSQ) [3] and was included in this research to identify assets, factors, and strategies from students’ activities, experiences, perceptions, faculty and staff validation, financial mediators, and motivation. The combination of these surveys was pilot tested with a panel of experts. Analysis from these data

collection efforts is ongoing and results will be shared as they become available. Further, the results will inform one more phase of data collection which will entail interviewing students, faculty, and staff to gain additional insight into both student quantitative responses and organizational strategy findings.

Data collection efforts from this project are intended to reveal important insights designed to push practice forward in the area of engineering student vertical transfer. The data will also be used to support the next phase of this CAREER research project. Future phases will pose additional research questions aimed at developing and evaluating a student-centered digital platform designed to provide personalized resources, an interactive practice guide, and virtual professional development modules.

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