Board 89: Broadening Participation in Engineering by Enhancing Community College to University Partnerships: Findings from a Tri-Institutional NSF Grant Partnership

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Dr. Walter Lee is an assistant professor in the Department of Engineering Education and the assistant director for research in the Center for the Enhancement of Engineering Diversity (CEED), both at Virginia Tech. His research interests include co-curricular support, student success and retention, and diversity. Lee received his Ph.D in engineering education from Virginia Tech, his M.S. in industrial & systems engineering from Virginia Tech, and his B.S. in industrial engineering from Clemson University.

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Dustin currently serves as the Graduate Research Assistant for the Virginia Tech Network for Engineering Transfer Students (VT-NETS) Program with the Engineering Education Department at Virginia Tech. His research focuses primarily on access issues for underrepresented/minority and low income students to bachelor degrees through community college pathways, curricular complexity for transfer pathways into engineering, higher education policy as barriers to access, and assessment and evaluation in a higher education context. Dustin is currently completing a PhD in Higher Education Research, Policy, and Finance.

Dr. David B Knight, Virginia Tech

David B. Knight is an Associate Professor and Assistant Department Head of Graduate Programs in the Department of Engineering Education at Virginia Tech. He is also Director of International Engagement in Engineering Education, directs the Rising Sophomore Abroad Program, and is affiliate faculty with the Higher Education Program. His research tends to be at the macro-scale, focused on a systems-level perspective of how engineering education can become more effective, efficient, and inclusive, tends to be data-driven by leveraging large-scale institutional, state, or national data sets, and considers the intersection between policy and organizational contexts. He has B.S., M.S., and M.U.E.P. degrees from the University of Virginia and a Ph.D. in Higher Education from Pennsylvania State University.

Abbey Rowe Erwin, Virginia Tech

Abbey Rowe Erwin is a Ph.D. student in the Higher Education Program at Virginia Tech. Her research interests focus on the transfer student experience, particularly the impact of institutional policies on transfer student success and the role of collaborative programming between two-year and four-year institutions. She has a B.B.A. from Roanoke College and a M.Ed. in Higher Education from the University of South Carolina.

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Community colleges are often touted as cost-effective gateways to four-year universities for academically-talented, low-income students. However, there is room for four-year institutions to play a much more actively engaged role in turning this promise into reality. Funded through the National Science Foundation (NSF) Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM) program, the Virginia Tech Network for Engineering Transfer Students (VT-NETS) project focuses on improving collaborations between Virginia Tech (VT) and two primary community college partners: Virginia Western Community College (VWCC), and Northern Virginia Community College (NOVA). The primary project objective of VT-NETS is to determine how a four-year institution can increase the success and efficiency of engineering transfer through community college-to-bachelor's degree pathways; the project hopes to spur an uptick in the attainment of A.S. and B.S. degrees in engineering by students from underrepresented groups.

Leveraging quantitative analyses of student data for transfer and non-transfer students in engineering as well as qualitative data collected from interviews and focus groups with students and key faculty and staff stakeholders working with engineering transfer students, we expand current work on transfer student capital, articulation agreement efficacy, transfer support services, enrollment and guaranteed transfer policies, coursework transfer processes, and co-curricular support programs within the undergraduate engineering context. Our poster will highlight major findings thus far, including: the impact of integrating community college students into university study abroad programs as a mechanism to preemptively help transfer students with the institutional transition process; the complexity of pre- and co-requisite course structures delaying degree progress; challenges in transfer of coursework processes and policies; critical combinations of courses that inhibit academic success for first semester transfer students; and lessons from cross-institutional grant partnerships between community colleges and a four-year university.

Summary of Selected Results

Results from our quantitative and qualitative analyses highlight some parts of community college-university partnerships that effectively support transfer student access and success, and yet others that become barriers for transfer students in engineering.

Cultivating a Cohort: Integrating Community College Students in Study Abroad

- By participating in VT-NETS students become eligible to participate in Virginia Tech's Rising Sophomore Abroad Program (RSAP) which includes a global engineering course and short-term (2-week) study abroad program. Students are integrated into tracks with first-time-in-college (FTIC) students from Virginia Tech through virtual classroom technologies and travel abroad in cohorts. In May 2018 the first group of VT-NETS students participated in RSAP trips to Europe and the United Kingdom/Ireland.
- Students and faculty/staff describe the positive impacts of integrating VT-NETS students into the RSAP program including: increased awareness of opportunities to engineer abroad, understanding engineering in a global context, and developing a cohort of students, both at the community college and university, that will serve as a support system before, during and after transfer.

Curricular Complexity in Engineering Transfer: Structural Delays to Timely Degrees

- We calculate and compare the complexity of curricular pathways to engineering bachelor's degrees for FTIC students with community college transfer students. We also explore differences across engineering disciplines seeking to understand how engineering degree choice impacts structural complexities students face in curricular mapping. A curriculum with greater complexity would be one with many sequences of courses with many prerequisites--thus, if one course goes poorly, a student's degree progression can be hampered significantly.
- We find significant differences in curricular complexity metrics across both student type (i.e., transfer student versus FTIC) and engineering discipline. Students who begin their journey to an engineering degree at a community college must navigate more complex curricular structures relative to students who begin at a four-year institution. Similarly, disciplines have different curricular complexities, and we show a strong relationship between curricular complexity and time to degree for engineering transfer students.

When Policies Intersect: Challenges in Transfer of Coursework Processes

- We conducted interviews with faculty and staff involved in transfer processes and policy implementation to broaden and deepen our understanding of the process of transferring coursework from community colleges to a university. Some of the salient findings focused on the challenges students face at the intersection of policies, particularly from those at the system/university level to those at the college/department.
- More specifically, an articulation agreement policy defines how to gain guaranteed admission to the college of engineering through the community college system pathway, but is contrasted with a college/department policy that restricts admission into degree granting programs via additional requirements in a student's first semester after transfer. Although both policies are well-intentioned, the intersection of the two policies as experienced by transfer students resulted in negative implications for transfer students' experiences and degree progression.

Compounding Transfer Shock: “Toxic” Course Combinations in 1st Semester Transfer

- Using an exploratory sequential mixed methods approach, we explore a phenomenon described in interviews with university and community college advisors of “toxic” course combinations students face in their first semester after transfer. Findings described in conversations with advisors are then examined using quantitative analyses of student course and grade-point average data.
- We find an unintended consequence of articulation policy whereby students are guaranteed admission but also have their general education course requirements fully completed/waived prior to transfer. Thus, transfer students are left only with an overload of technical and upper level major coursework in their first semester after transfer. In combination, some of these courses are found to be toxic influencers to first semester GPA.

Advancing a key deliverable from this NSF grant, our project serves as an example for how to establish stronger networks between a university and feeder community colleges. Further, we provide a guide for four-year institutions and community colleges educators to develop new interventions which enhance transfer pathways as well as identify pitfalls or gaps in services and transfer structures that need be remedied. Ultimately, these findings illuminate and help prioritize the human, financial, and physical resources dedicated towards supporting all transfer students in engineering.

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