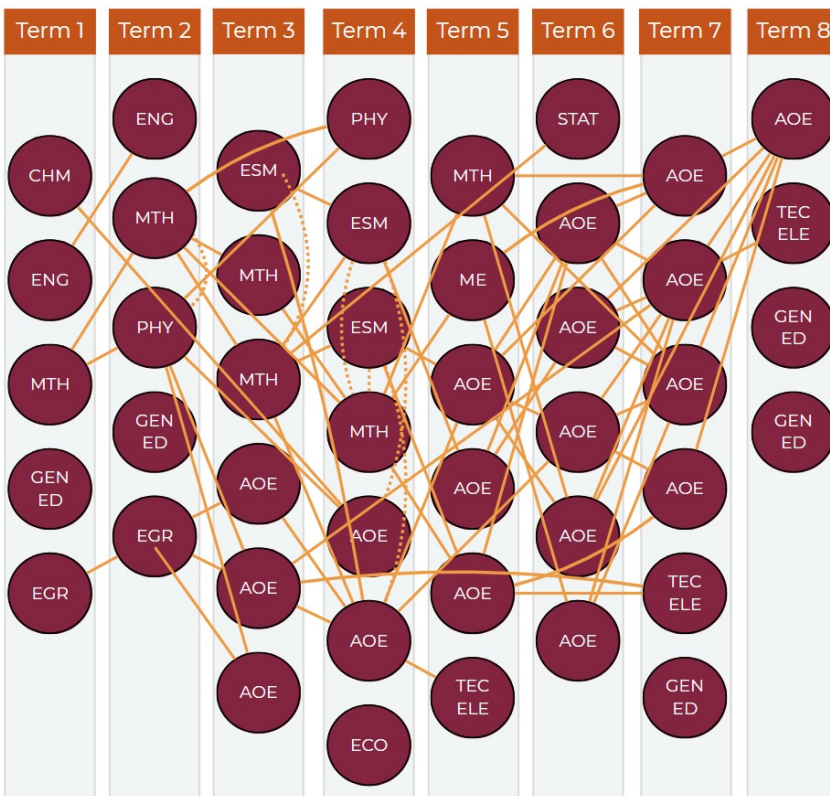


UNDERSTANDING CURRICULAR COMPLEXITY FOR ENGINEERING TRANSFER STUDENTS

The sequential nature of engineering curricula presents unique challenges for engineering students transferring from community colleges. This research brief examines a study published in the *Community College Journal of Research and Practice* by Grote et al. (2020). The researchers utilized the concept of curricular complexity (Heileman et al., 2017) to evaluate the intricacies of engineering program curricula. This approach allows for a numerical comparison of between transfer and FTIC student curricular pathways.



Understanding the curricular complexity of engineering transfer pathways is crucial for improving credit transfer processes, enhancing the efficiency of degree completion for transfer students, and informing articulation policy decisions

This study examined curricular pathways using document analysis of academic plans of study from university and community college catalogs. The dataset included 14 bachelor's degrees from the university's engineering college and 14 associate of science degree pathways from four community colleges, resulting in 70 unique engineering degrees.

An example FTIC curricular complexity map is to the left.

Curricular complexity for a total of 70 degree plans was calculated using the methodology developed by Heileman et al. (2017), which provides a systematic approach for measuring the intricacy of an academic program's curricular structure.

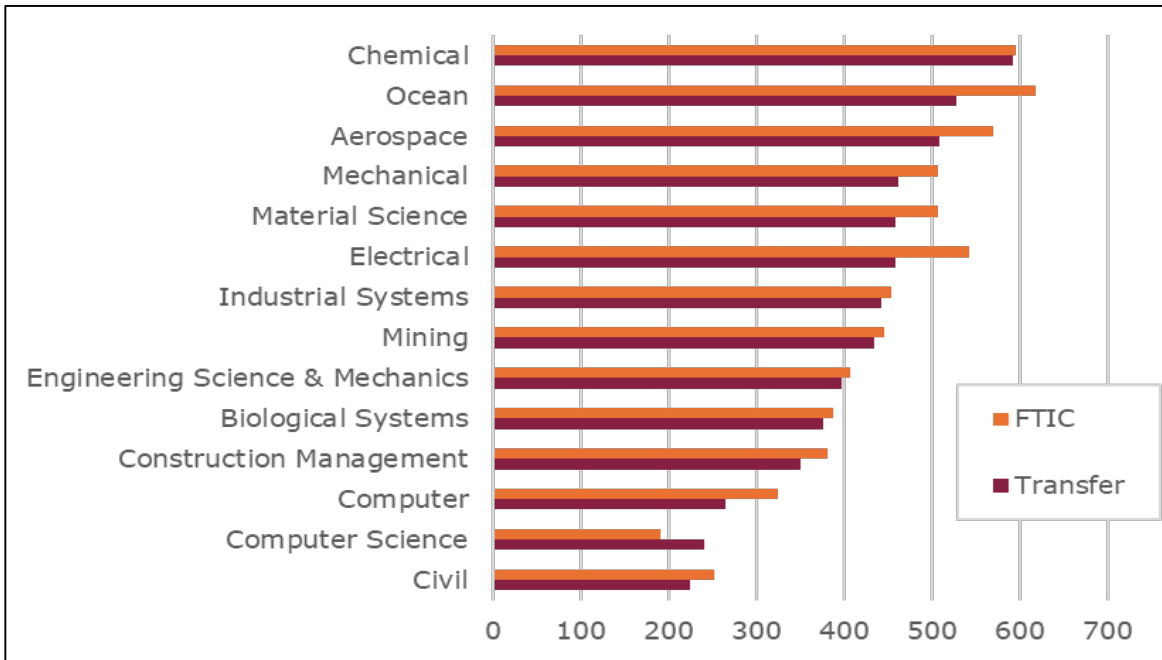
Adapted from: Grote, D. M., Knight, D. B., Lee, W. C., & Watford, B. A. (2020). Navigating the Curricular Maze: Examining the Complexities of Articulated Pathways for Transfer Students in Engineering. *Community College Journal of Research and Practice*, 1–30. <https://doi.org/10.1080/10668926.2020.1798303>





Curricular Complexity

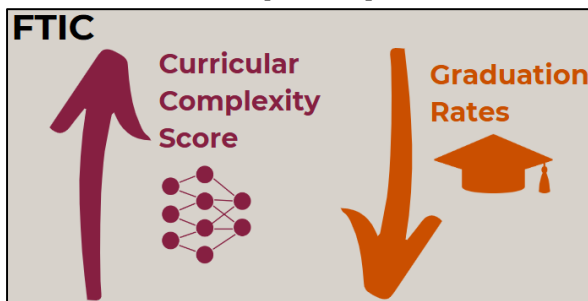
Analysis revealed that transfer pathways are generally less complex compared to the FTIC pathway. This finding holds true when comparing average transfer bachelor's degree complexity score (417) to average FTIC complexity score (441) and for nearly every engineering discipline at this institution (below).



Curricular Complexity & Time to Degree

Despite having lower average curricular complexity scores, transfer students took longer than FTIC students to graduate. When comparing FTIC students to transfer students at the four-year mark (or at two years for transfer students following the purported 2+2 transfer logic), transfer students lagged across all engineering disciplines.

Curricular Complexity & Graduation Rates



As the curricular complexity score increased, the graduation rates for FTIC students decreased. The more complex a curriculum, the lower the 4, 5, and 6-year graduation rates in that program. This finding was consistent with previous research on this group of students.

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Curriculum (FTIC Students)

Curricula with highly sequential designs may adversely affect the time it takes for FTIC students to complete their degrees, and therefore, should be regularly reviewed by curriculum committees.



PRACTICAL CONSIDERATIONS

- Are there ways to decrease complexity by eliminating unnecessary pre-/co-requisites?
- What is causing the increased complexity score?
- Are there certain courses that create a bottleneck that increase the score?
- Are there ways to support students in classes that are important for progressing through their degree?

We Need a Better Measure for Complexity of Transfer Pathways

The authors pose three major flaws with the curricular analytics metric and tool for transfer students:

- 1) It does not account for credits lost during the transfer process; credits that do not count towards a degree also increase complexity.
- 2) It does not penalize strings of pre-requisite courses not offered at the specific timepoints, which may



PRACTICAL CONSIDERATIONS

- Are there "wasted credits" required that will not be applied to the student's bachelor's degree requirements?
- Are students following "optimal" degree plans?
- Is the timing of course offered post transfer conducive to the progression of transfer students?
- Are students retaking courses (e.g., by recommendation of advisors out of concern for lack of rigor) at universities?
- How can we better measure complexity for transfer student pathways?

extend time-to-degree for community college transfers (89% of 70 transfer degree pathways could not be completed in 8 semesters).

- 3) It does not account for timing of when courses are offered, which can be challenging for transfer students who seek to enter the curriculum at various timepoints.

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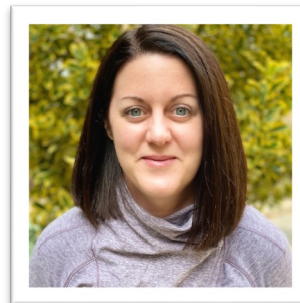
ROPES HUB

Research on Organizational Partnerships in Education & STEM

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Dustin Grote is an Assistant Professor in the School of Education at Weber State University. His research focuses on enhancing transfer student pathways through enhancing transfer partnerships, systems, processes, curriculum, and institutional practices.



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About the ROPES Hub

The Research on Organizational Partnerships in Education in STEM (ROPES) Hub advances understanding of organizational partnerships that support academic pathways for domestic low-income engineering and computing students through a broad community of practice and a multi-faceted research agenda.

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