Classroom Connections:
A Social Network Analysis of STEM Students at a Regional University

Wanchunzi Yu, Laura R. Ramsey, Tom Kling, & Martina Arndt

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BACKGROUND

•Students' levels of connectedness with peers is correlated with their success and retention in college (e.g., Bronkema & Bowman, 2019; Goguen, Hiester, & Nordstrom, 2011; Pascarella & Terenzini, 2005)
•One experimental intervention demonstrated that peer connections increased student retention, especially among students of color (Rasco et al., 2020)
•Most of this research focuses on primarily-residential colleges, where peer connections are fostered in residence life and extracurricular student activities
•Understanding peer connections in the classroom could reveal mechanisms for supporting students at institutions with large commuter and first-generation populations

RESEARCH QUESTIONS

•What do peer networks in the College of Science and Math look like?
•How do peer networks vary by race, gender, first-generation status, and/or commuter status?
•How does a student's degree of connectivity relate to graduation rates and GPA?

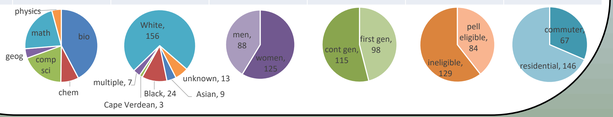
METHOD

•Conducted social network analysis in a cohort of STEM majors (*N*=205) who began college in Fall 2015 at a mid-sized, regional university
•Connections defined by taking courses together any time while at BSU
•Gathered academic records related to grades, six-year graduation rate, and demographic information from Fall 2015 to Spring 2021
•Students were analyzed separately by major in order to control for differences in size and structure of majors

SAMPLE

Major	Total *N*	Students of Color	Women	First-Gen	Pell-Eligible	Commuter
Biology	90	28	66	43	42	29
Chemistry	17	6	11	10	6	5
Computer Science	41	14	7	19	19	9
Geography	9	1	3	3	2	2
Mathematics	47	6	38	18	14	17
Physics	9	1	0	5	1	5

Whole sample:



RESULTS

What do peer networks in the College of Science and Math look like?

Generally, the networks seemed fairly dense, though they vary across majors and for individual students.

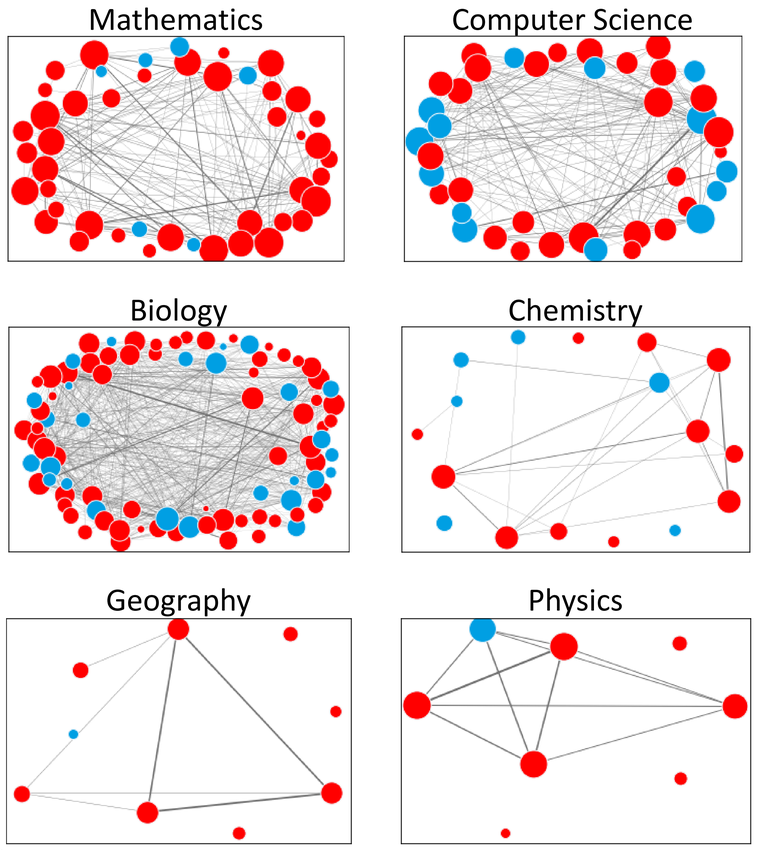
- On average, students have two peers that they take multiple classes with
- Averages vary across majors from a low of 1.78 (biology) and 1.79 (computer science) to a high of 6 in physics

Figures below depict the density of the networks within each major:

- Each circle represents a student
- Size of the circle represents how connected that student is
- Lines represent connections between pairs of students
- Thickness of the lines represent the strength of connections between pairs

How do peer networks vary by race, gender, first-generation status, and/or commuter status?

Peer networks varied by race but not other demographic characteristics. White students were more connected to well-connected peers than students of color, p=.04. Figures below depict blue circles for students of color and red circles for White students. Sample sizes were too small to disaggregate further by race.



How does a student's degree of connectivity relate to graduation rates and GPA?

We tested degree (number of connections), eigen degree (accounts for the importance of particular connections), and betweenness centrality (measure of influence in the network).

- Logistic regression revealed that connectedness (i.e., degree) significantly predicts graduation (estimate = .71, p<.001), controlling for high school GPA (estimate = 1.71, p<.001).
- Logistic regression revealed that connectedness to important peers (i.e., eigen degree) significantly predicts graduation (estimate = 3.35, p<.001), controlling for high school GPA (estimate = 1.70, p<.001).
- Multiple regression revealed that connectedness to important peers (i.e., eigen degree) significantly predicts overall college GPA (estimate = .77, p=.03), controlling for high school GPA (estimate = .53, p<.001) and gender (estimate = -.10, p=.14).

DISCUSSION

Summary of Findings:

•White students have more well-connected peer connections than students of color
•Students with more peer connections are more likely to graduate and (to a small degree) have higher GPAs

Limitations:

•These are exploratory analyses
•All data are from a single institution

Current Work & Future Directions:

•We have also found that networks from just the first two years of college predict graduation and GPA
•We are replicating this work with the 2016 cohort to confirm the patterns we observed in this exploratory analysis
•We are currently conducting a randomized controlled trial of linked-learning communities that purposefully increase peer connections in the classroom
•Social network analysis is a powerful tool that could be better utilized in higher education to understand a wide array of issues (e.g., impact of curricular changes, how collaboration occurs among faculty/staff, etc.)