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The Effect of a Collaborative Environment on Engineering Students' Social Networks

Hannah Corbin
Noor Aulakh, Rowan University
Alex Herrman, Rowan University
Conor Peterson
Shahir Shariful Mollah
Darby Rose Riley, Rowan University

Darby Riley is a student of engineering education at Rowan University. She has a special interest in issues of diversity and inclusion, especially as they relate to disability and accessibility of education. She is a founding member of Rowan University's

Dr. Kaitlin Mallouk, Rowan University

Kaitlin Mallouk is an Associate Professor of Experiential Engineering Education at Rowan University. Prior to beginning that role, she spent five years an Instructor in the Mechanical Engineering and Experiential Engineering Education Departments at Rowan. Kaitlin has a BS in Chemical Engineering from Cornell University and an MS and PhD in Environmental Engineering in Civil Engineering from the University of Illinois.

The Effect of a Collaborative Environment on Engineering Students' Social Networks

Abstract

In this full student-led research paper, we examine how collaborative learning impacts the social networks of engineering students. We believe this is important because it will provide us with insight into how collaborative learning can affect feelings of social connectedness, which is known to impact students' academic success.

A survey was designed and sent to senior undergraduate engineering students at a mid-sized, Mid-Atlantic university. The survey included demographic questions (gender, race/ethnicity, year, etc.), questions about the student's perceptions of their social connectedness and their instructors tendency to promote collaborative learning, and a series of questions designed to elicit the student's social network. These questions used the affective approach for eliciting social networks, which asked students to name up to 10 of their closest friends at the university and provide basic demographic information for these friends (the friend's major, race/ethnicity, and gender) as well as information about how the student interacts with each friend. Finally, participants indicated which of the identified close friends know each other , and to what degree (strangers, moderate friends, or close friends). From this, an ego network (network of direct ties) was generated for each student participant.

Data analysis using the network analysis software OraLite and Excel were used to explore ego network social capital and clustering coefficients. Similarly, students may have greater social capital (i.e., access to more resources through their social network) when collaboration is encouraged—for example, students in collaborative environments may work with their closest friends on homework assignments and team projects. The clustering coefficient is a measure of the overall connectedness of one's network (how many of your friends know each other?), and can be used to infer the overall interconnectedness of a student's social network. Taken together, these analyses can describe the ways in which collaborative learning may shape a students' social networks and perceptions of social connectedness.

The results of this study indicate that, in instances where students perceived that their instructors implemented collaborative learning more often, a student's social network became more densely interconnected. Additionally, the number of friends a student chooses to work with is positively correlated to how often said student works or studies in a group setting. We also found a correlation between social connectedness within a department and the competitiveness of the department. These findings can be used to inform instructor's pedagogical approaches and provide additional support for the benefits of collaborative learning.

Introduction

Collaborative learning has become a popular teaching tool for instructors who wish to increase student interaction and student academic outcomes. Put simply, collaborative learning "promotes the building of peer relationships, fosters peer interactions and by involving students in different discussions, it enables them to understand different perspectives, and to give and receive feedback" [1]. Collaborative learning has been shown to help develop students' higher level thinking, leadership, and communication skills [2]. This is beneficial for students because it boosts their self esteem and prepares them for real life social and professional interactions [2].

In this study, we explore the relationship between collaborative learning and the social networks of engineering students attending a mid-sized Mid-Atlantic University. The primary goal of this study is to explore the use of collaborative learning by the faculty, and the way collaborative learning impacts the social network of the engineering students at this university. This research paper will investigate the effects of collaborative learning on student social networks by exploring the following research question: *How does collaborative learning impact the social networks of engineering students?*

Background

Engineering students face a lot of stress and responsibilities throughout their undergraduate education. There is, however, evidence that having a strong and densely populated social network in college benefits a student's mental well-being [3] and working with others can increase a student's academic success [4]. The opposite is also true: student isolation often leads to decreased academic success [5]. The pedagogical approaches used by instructors influence students' opportunities for academic collaboration and affect the social opportunities of students. Understanding the impact collaborative learning has on student connectedness and isolation can give insight to instructors and department leadership to better help students.

There are a variety of ways in which students can collaborate with each other in class, and potentially increase the scope of their social network. For example, team projects include assignments that students are required to complete with one or more classmates. These projects give students opportunities to meet together and possibly form relationships outside of the classroom. Students may also be asked to share ideas with classmates informally during individual class periods (e.g., participating in a "Think, Pair, Share" activity").

Collaborative Learning

In higher education, instructors desire to use teaching techniques to help improve student outcomes. The instructional techniques used affect student learning outcomes and student

success. Collaborative or cooperative learning involves students working together on an assignment, such as a test, project, or homework problem. Through collaborative learning, students are more productive and have higher academic achievements together [6]. Collaborative learning is also beneficial because it helps students to build relationships with each other. It presents an opportunity for students to interact with others and can lead to the development of relationships and friendships [1]. Having supportive interactions with other students can result in positive academic performance, acquisition of knowledge, and raise the self esteem of the student [7]. Collaborative learning can create a team spirit which motivates students who understand course material to assist team members who may be struggling and, simultaneously, students who were assisted then feel motivated to put more effort into the team's work since they received help [8]. The environment created from collaborative or cooperative learning provides students with increased motivation to learn and benefits student performance in the classroom.

Student Social Lives

Human social environment has been defined as, "the immediate physical surroundings, social relationships, and cultural milieus within which defined groups of people function and interact" [9]. The social environment of an individual influences who a person interacts with and in turn can affect much of their day to day.

Students tend to seek out individuals who have the same experiences as them, which can create stronger friendships [10]. Students typically become friends with other students through on-campus events and are in turn are more likely to continue to go to events and become more involved. Making new friends allows students to feel more connected to the school they attend and can lead to feelings of success [10]. This can have a positive impact on a student's college experience and encourage them to continuously go out and meet new people. In addition, it has been shown that college students who have regular social interactions tend to fare better in their adult lives [11]. However, according to Goldschneiger, et al. typically, engineering students are likely to avoid extracurricular activities because of lack of time or energy [12]. Because of this, students favor socialization that is readily available and convenient, rather than a method that takes more effort. In addition, it has been noted that there is inadequate socialization in engineering specific events, which disinterests students looking to make friends. As a result, students are more likely to turn to other methods to make friends, like socializing with other students in their classes [12].

As stated above, not being able to form genuine relationships with classmates can lead to a decrease in academic success. A lack of social interaction for a student can create feelings of loneliness and increase symptoms of depression [13], which, in turn, can lead to lower academic performance and have negative effects on relationships with other students and teachers [14]. More broadly, social isolation can come from just avoiding social events or feelings of anxiety

that prevent an individual from making new friends. In contrast, a strong social life leads to social connectedness which results in a strong social network for individuals. With a good social network, students can create more bonds which can result in future collaborations as they move on in their academic years.

Social Network Analysis

In this study, we used social networks to analyze the effect of students' perceptions of their degree programs' teamwork and collaboration requirements on the students' social networks. To do this, we created ego networks ("egonets") for each participant. In an egonet, the study is centered around the connections that one person, the ego, has to others, the alters [15]. An example of what a typical egonet looks like can be seen in Figure 1.

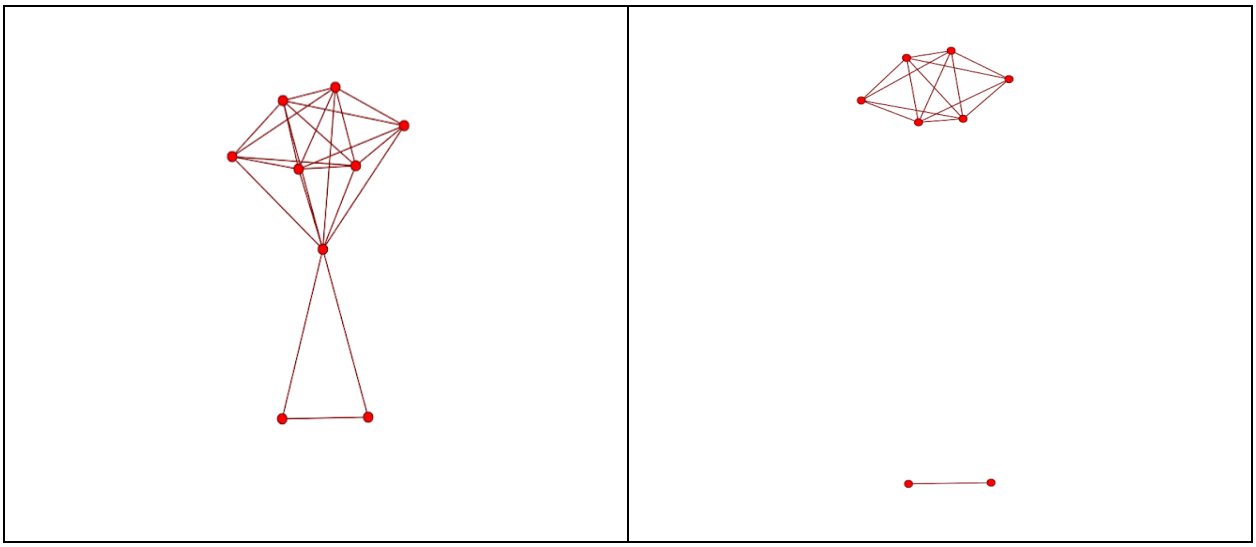

Figure 1. Example ego social network with the ego-node and ego-alter connections (left) and without the ego-node and ego-alter connections (right). Note that in the right image, the ego-alter connections are implied, and separate groups/cliques are more obvious.

In the image on the left, the egonet is displayed with the ego node as part of the network, located in the middle (right above the bottom two nodes, at the top of the triangle). This study utilizes the method on the right, where the ego itself is not pictured, because with the ego node removed from the network, it truly displays the composition of that student's network. In both images, the lines connecting the nodes represent the relationship between those nodes (or alters).

Social network analysis can be used to help understand how student networks are formed in educational settings, how these networks impact the students, help develop an understanding of the network norms that exist within the classroom and reveal aspects of undergraduate learning. The goal of using social network analysis is to either understand what causes these relationships to be formed or to understand the impact that these ties have on students [16].

In our study, we are concerned with the egonets of engineering students at a mid-sized Mid-Atlantic University, and specifically how collaborative learning impacts the development of their egonet. We want to build egonets for the students to determine if there is a relationship between the structure of a student's egonets and the student's characterization of the amount of teamwork required in their major classes. The network characteristics of interest are social capital and clustering coefficient.

Social capital is a measure of worth that comes from human interactions, and is typically found in the ties that are made between individuals in a social network. The social capital that exists within the social network of an individual can play a major role in their success in school, work or in their personal life [17]. Using an egonet, the quality and quantity of an individual's connections with others and the level of support they receive from their classmates and colleagues can be quantified through social capital [15]. In this study, social capital is defined as the number of friends a student indicated they work with academically—in other words, the number of friends a student also uses as an academic resource.

The clustering coefficient is a measure of network density, reflecting the interconnectedness of an individual's egonet. Figure 2 shows two different students' social networks. The left social network has a clustering coefficient of 0.14. This is a low clustering coefficient which indicates that the ego's network of friends are mostly not friends with each other. Each node is connected to the ego, but there are only a few connections seen amongst the alters, with five nodes not connected to any others. The social network on the right shows an interconnected social network with a high clustering coefficient of 1.0. The dense interconnectedness demonstrates that the ego is part of a singular, cohesive group, where all of the alters know each other [15].

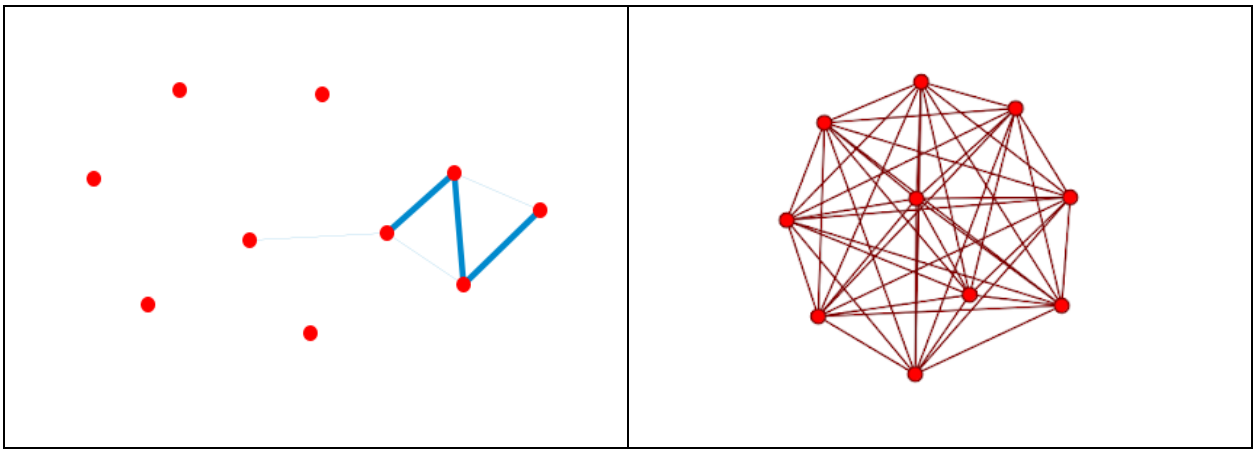

Figure 2. Student Social Networks examples to demonstrate clustering coefficients. The egonet in the left image has a clustering coefficient of 0.14, whereas the egonet on the right has a clustering coefficient of 1.0.

Methods

To address the research questions, a survey was deployed to engineering students in their senior year (anticipated graduation in Spring 2023) at a mid-sized Mid-Atlantic university. The total population given the opportunity to participate in the survey was 529 engineering students. This population breaks down to 50 biomedical engineering seniors, 124 civil and environmental engineering seniors, 52 chemical engineering seniors, 140 electrical and computer engineering seniors (ECE), 13 engineering entrepreneurship seniors, and 150 mechanical engineering seniors.

The full survey can be found in the Appendix. Appropriate approval for human subject research was obtained before distributing the survey. The survey began with a series of demographic questions including GPA, race, age, and gender to have relevant background information for the analysis process. The survey then asked questions about what department each student is a part of, and if the department is encouraging teamwork. After these questions, the participant was asked to list up to 10 of their closest friends at the institution and then asked about the listed friends including whether the listed friend was the same major and race as the participant, if the participant studies with each friend, and whether connections exist between the named friends.

The survey was emailed to senior engineering students, but it is possible for there to be a few juniors, by academic year, that answered the survey due to having above 90 credits towards their degree. Survey results were analyzed using Excel, Ora-Lite and SPSS. The statement responses were given numeric scores ranging from 1 to 5 depending on the number of response options, with 1 corresponding to strongly disagree or never.

Results and Discussion

The survey was distributed to 531 senior engineering students. We received 22 responses of varying completeness. Table 1 shows the demographics of the participants.

Table 1. Demographics of the students who completed the survey.

Major	N male	N female	Total
ECE	5	2	7
ME	10	1	11
ChE	2	2	4
Total	17	5	22

Clustering Coefficient

A one-way ANOVA was conducted to compare clustering coefficients by how often participants reported that their professors assigned group work. Normality of the continuous outcome variable was checked and found to be within range. There was a statistically significant difference in clustering coefficients based upon how many group assignments students reported that their professors assign ($p<0.001$). The effect size for this analysis was $\eta^2 = 0.72$ with a 95% CI [0.27, 0.82], indicating that 72% of the variance in the students' clustering coefficients can be explained by how much group work professors assign. This is a large effect size, and the confidence interval indicates that replications may find similar results.

Post hoc power analysis suggests the test was underpowered ($1-\beta = 0.70$) with a small sample size ($n = 21$). Figure 3 shows the mean clustering coefficient by frequency of assigned group work, with error bars demonstrating 95% confidence intervals.

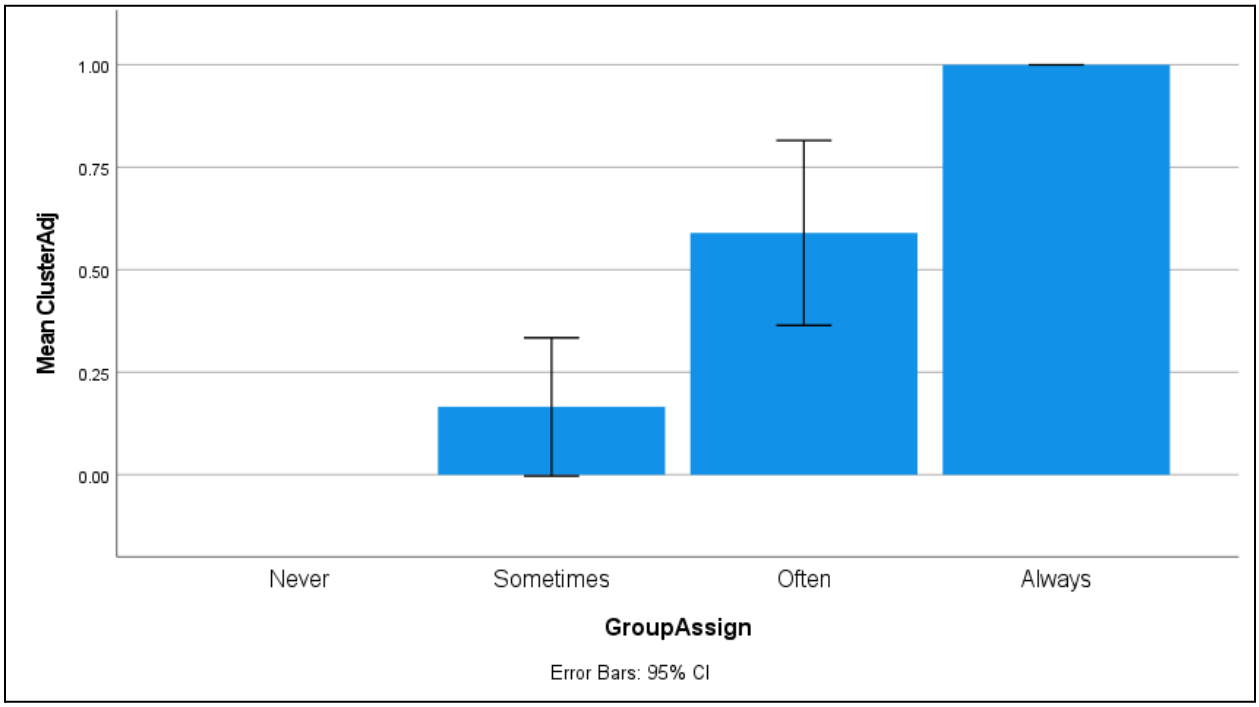

Figure 3. Bar graph of mean clustering coefficient by frequency of group work assignments with 95% confidence interval.

These results indicate that as students are assigned more group work (collaborative learning), leads to a more interconnected friend group. In some cases, collaborative learning has socially benefited students because students felt more relaxed when completing school work and felt it was an environment they can make friends in [18]. Collaborative learning has been shown to enhance social interaction amongst students [19]. Therefore, it is likely that there will be more interconnected friend groups when collaborative learning is more common because it creates a

more friendly environment and there is enhanced socialization amongst the students. The students in this study could feel that completing school work takes up the majority of their time so the best time to make friends is while working on projects; as more group projects are assigned, more friend groups are created.

Social Capital

A one-way ANOVA was conducted to compare how many friends a student works with (social capital) by how often a student chooses to work in a group setting. Normality of the continuous outcome variable was checked and found to be within range. There was no statistically significant difference ($p=0.26$). The effect size for this analysis was $\eta^2 = 0.18$ with a 95% CI [0.00, 0.37], indicating that 18% of the variance in social capital can be explained by the time spent performing work in a group setting. This is a small effect size, and the confidence interval indicates that replications may find larger effect sizes.

Post hoc power analysis suggests the test was underpowered ($1-\beta = 0.19$) with a small sample size ($n = 24$). Based on this result, the ANOVA found no statistical difference, but there appears to be a pattern present in the data indicating that when students work in a group setting more often, they tend to work with more of their friends. This pattern is shown in Figure 4.

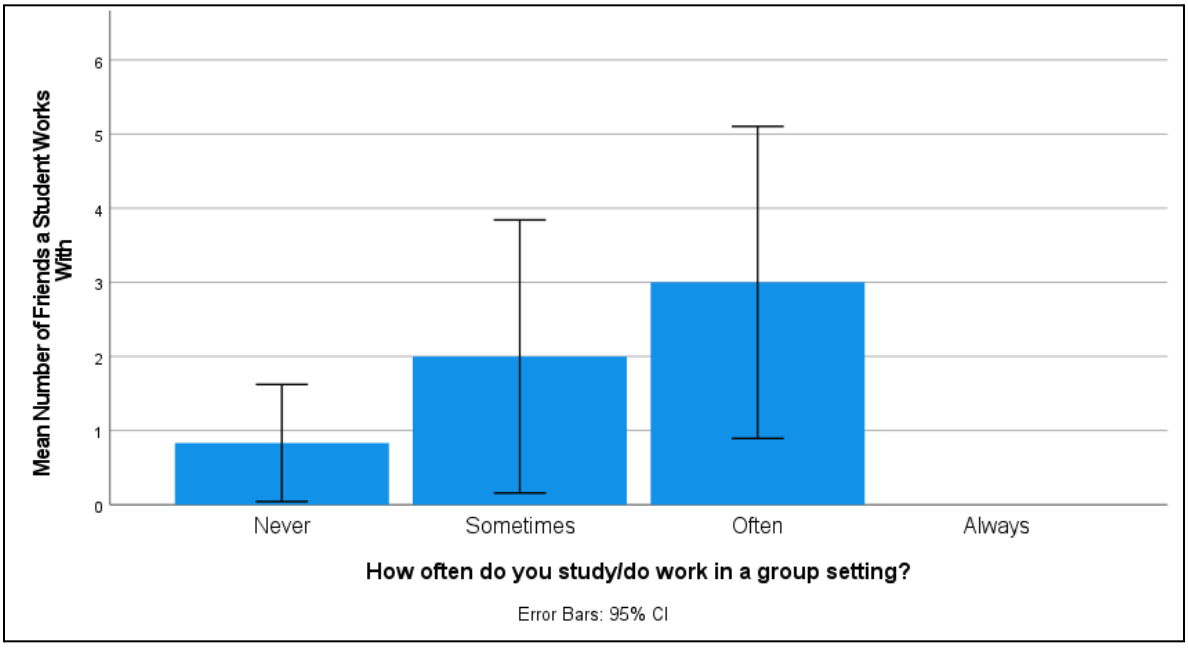

Figure 4. Bar graph of social capital by frequency of working in a group setting with 95% confidence interval.

These results demonstrate an emerging pattern indicating that, when students work in a group setting, they tend to work with more of their friends. This might be because they are already

comfortable with the act of collaboration, and some students use it as an opportunity to build and enhance their friendships. Previous research has found that, in instances of pleasant collaboration, students are likely to form friendships with their group members [20]. Another study found that friendship is promoted when students learn about each other's skills and experiences [21]. The results could be showing that the presence of pleasant collaboration are forming new friendships causing a higher average number of friends when a student works within a group setting more. This might also explain how the results are increasing when students work more often within a group setting because the students are learning about each other's skills and experiences and becoming friends. In this study, the trend appears to be following a similar pattern, where students tend to work with more friends as they work more in a group setting.

Student Perception

A Spearman's rho correlation analysis was conducted to evaluate the strength and direction of the relationship between department competitiveness and social connectedness. The rank-order correlation test was selected since the variables being considered are ordinal. The results of this data analysis are shown in Figure 5.

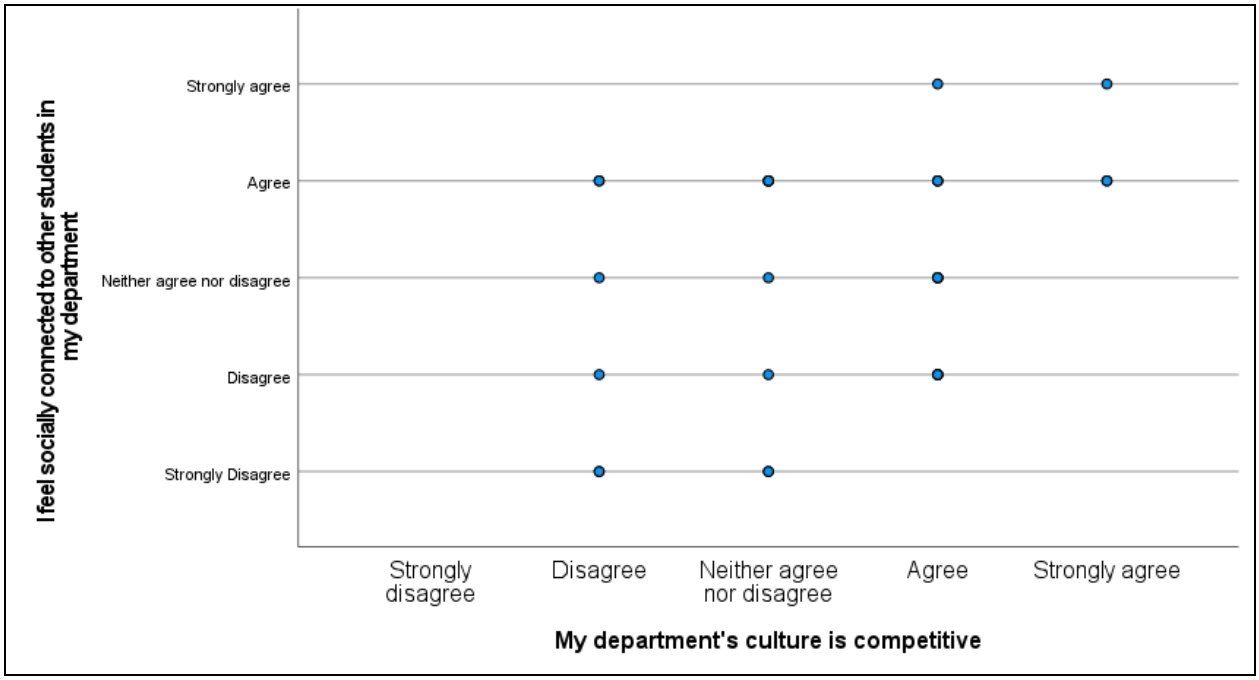

Figure 5. A Spearman's rho correlation between social connectedness of students within a department and the department's competitiveness.

There was a relationship approaching statistical significance between perceived department competitiveness and social connectedness, $\rho = 0.33$, 95% Bootstrap CI [-0.05, 0.63], $p = 0.08$, n

= 27. The effect size for this analysis was $\rho 2 = 0.11$, 95% Bootstrap CI [0.00, 0.40], indicating that 11% of the variance between department competitiveness and social connectedness is shared in this data. This is a small effect size, and replications are likely to find a similar effect. Post hoc power analysis suggests that the test was underpowered ($1-\beta = 0.39$) with a small sample n = 27.

These results indicate that as the department culture becomes more competitive, students report feeling more socially connected to other students in their department. In some cases, "healthy competition" can increase student engagement and promote the development of a competitive social community [22]. In previous studies, students have found that "co-operative competition" (meaning competition between student teams) can increase class unity and improve the social atmosphere [23]. When there is a balance between competitive learning and cooperative learning, learning opportunities for students are enhanced [24]. The results are showing that there could be an aspect of "cooperative competition" present, fostering class unity and social atmosphere of the students. This would explain why as the department culture is reported more competitive, it is also reported as more socially connected. The students in this study could believe that the competitiveness of their department causes more interactions between students making them feel more socially connected.

Limitations and Future Work

While we did not conduct any specific tests to determine the validity and reliability of the survey we deployed in this study, the survey was constructed objectively and focused on the perception of the students. An example can be found referring to question 12 in the appendix, "How often do you study/do work in a group setting?" A student's answer depends only on their perception of how long they study or do work in a group setting. Since we asked students of their perceptions, we can expect the same results if the survey was to be redistributed to the same students. A student's perception of what a friend is can also differ. This could have led to inconsistencies in data collection. Additionally, despite sending the survey to and reminders to 529 students, we only received 22 responses. With a larger sample size, we would have more statistical power to confirm the trends identified in this preliminary work.

Conclusions

Overall, these results indicate that as students are assigned more group work, their friend groups become more interconnected. This may lead to more academic success for the students and also more prosperous social lives as deeper connections are formed. Collaborative learning has previously been shown to benefit students' social lives, which is further proved through this research. Furthermore, there appears to be a pattern present in the data indicating that when students work in a group setting more often, they tend to work with more of their friends. This further shows that deeper connections are being formed through the classroom. It may be

collaborative learning environments that are aiding to promote student communication and social skills. The results indicate that as the department culture becomes more competitive, students report feeling more socially connected to other students in their department. Although this may seem to diminish the effects of collaborative learning, it is possible that competitive learning is also aiding students, or that collaborative learning and competitive learning may be used together and both benefit student outcomes. Studies have shown that cooperative competition can also create a social environment which might explain how the more competitive department culture is also leading to a more socially connected student body as a result of this study.

Acknowledgements

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References

[1] R. D. Poth, "Collaboration: Bringing Students Together to Promote Learning," Getting Smart, Oct. 11, 2018. https://www.gettingsmart.com/2018/10/11/collaboration-bringing-students-together-to-promote-learning-can-move/ (accessed Feb. 09, 2023).

[2] "Collaborative Learning | Center for Teaching Innovation." https://teaching.cornell.edu/teaching-resources/active-collaborative-learning/collaborative-learning (accessed Feb. 09, 2023).

[3] C. H. Liu, S. Pinder-Amaker, H. "Chris" Hahm, and J. A. Chen, "Priorities for addressing the impact of the COVID-19 pandemic on college student mental health," Journal of American College Health, vol. 70, no. 5, pp. 1356–1358, Jul. 2022, doi: 10.1080/07448481.2020.1803882.

[4] V. D. Tran, "Does Cooperative Learning Increase Students' Motivation in Learning?," IJHE, vol. 8, no. 5, p. 12, Jul. 2019, doi: 10.5430/ijhe.v8n5p12.

[5] K. McAlpine, "Depression, Anxiety, Loneliness Are Peaking in College Students," Boston University, Feb. 17, 2021. https://www.bu.edu/articles/2021/depression-anxiety-loneliness-are-peaking-in-college-students/

[6] M. Laal and S. M. Ghodsi, "Benefits of collaborative learning," Procedia - Social and Behavioral Sciences, vol. 31, pp. 486–490, 2012, doi: 10.1016/j.sbspro.2011.12.091.

[7] “Advice: Benefits of making friends in college,” The Eastern Echo. https://www.easternecho.com/article/2022/09/advice-benefit-of-making-friends-in-college (accessed Feb. 09, 2023).

[8] Ö. Göl and A. Nafalski, “Collaborative Learning in Engineering Education”.

[9] E. Barnett and M. Casper, “A definition of ‘social environment’.,” Am J Public Health, vol. 91, no. 3, p. 465, Mar. 2001, Accessed: Feb. 09, 2023. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1446600/

[10] L. C. Farrell, D. Jorgenson, J. Fudge, and A. Pritchard, “College Connectedness: The Student Perspective,” JoSoTL, vol. 18, no. 1, pp. 75–95, Feb. 2018, doi: 10.14434/josotl.v18i1.22371.

[11] C. L. Carmichael, H. T. Reis, and P. R. Duberstein, “In your 20s it’s quantity, in your 30s it’s quality: The prognostic value of social activity across 30 years of adulthood,” Psychology and Aging, vol. 30, pp. 95–105, 2015, doi: 10.1037/pag0000014.

[12] B. Goldschneider, N. P. Pitterson, J. M. Case. “Disciplinary Socialization in First-year STEM Students”. Proc. of the American Society for Engineering Education Annu. Conf. & Expos. Virtual due to Covid-19. June 22, 2020.

[13] H. Liu, M. Zhang, Q. Yang, and B. Yu, “Gender differences in the influence of social isolation and loneliness on depressive symptoms in college students: a longitudinal study,” Soc Psychiatry Psychiatr Epidemiol, vol. 55, no. 2, pp. 251–257, Feb. 2020, doi: 10.1007/s00127-019-01726-6.

[14] S. Bekova, J. Dementeva, and I. Smirnov, “Factors associated with depression among university students: the role of students satisfaction.” SocArXiv, Nov. 24, 2021. doi: 10.31235/osf.io/9fg8t.

[15] “Ego Network Analysis — The key to enhancing Employee Social Capital | by Togy Jose | OrgLens | Medium.” https://medium.com/orglens/enhancing-employee-social-capital-with-ego-network-analysis-4ff0fc6738e3 (accessed Feb. 09, 2023).

[16] D. Z. Grunspan, B. L. Wiggins, and S. M. Goodreau, “Understanding Classrooms through Social Network Analysis: A Primer for Social Network Analysis in Education Research,” *LSE*, vol. 13, no. 2, pp. 167–178, Jun. 2014, doi: 10.1187/cbe.13-08-0162.

[17] “What Is Social Capital? Definition, Types, and Examples,” Investopedia. https://www.investopedia.com/terms/s/socialcapital.asp (accessed Feb. 09, 2023).

[18] S. Ghavifekr, “Collaborative learning: A key to enhance students' social interaction skills,” MOJES: Malaysian Online Journal of Educational Sciences. [Online]. Available: http://ojie.um.edu.my/index.php/MOJES/article/view/26394. [Accessed: 13-Feb-2023].

[19] A. F. Mena-Guacas, J. A. U. Rodríguez, D. M. S. Trujillo, J. Gómez-Galán, and E. López-Meneses, “Collaborative learning and skill development for educational growth of artificial intelligence: A systematic review,” *Cont. Ed. Tech.*, vol. 15, no. 3, p. ep428, Jul. 2023, doi: 10.30935/cedtech/13123.

[20] Q. Wang, “Design and evaluation of a collaborative learning environment,” Computers & Education, vol. 53, no. 4, pp. 1138–1146, 2009.

[21] A. Almajed, T. Winning, V. Skinner, and R. Peterson, “Medical and Dental Students’ Perceptions and Experiences of Collaborative Learning: A Systematic Review,” *JBI Libr Syst Rev*, vol. 9, no. 32 Suppl, pp. 1–13, 2011, doi: 10.11124/01938924-201109321-00001.

[22] I. Cantador and J. M. Conde, “A simple e-learning system based on classroom competition,” Sustaining TEL: From Innovation to Learning and Practice, pp. 488–493, 2010.

[23] “Cooperative learning in a competitive environment: Classroom ... - ISETL.” [Online]. Available: https://www.isetl.org/ijtlhe/pdf/IJTLHE121.pdf. [Accessed: 13-Feb-2023].

[24] R. Roslan, “Implementation of gamified mobile application to increase engagement and society inclusiveness by integrating strategy game and E-Quiz”, 2021. https://ir.uitm.edu.my/id/eprint/55904/

Appendix

Q1 Informed Consent

You are invited to participate in this online research survey entitled Student Resource Usage. You are included in this survey because you are a current undergraduate student of engineering at Rowan University. The number of subjects to be enrolled in the study will be 90.

The survey may take approximately 5-10 minutes to complete. Your participation is voluntary. If you do not wish to participate in this survey, do not respond to this online survey. Completing this survey indicates that you are voluntarily giving consent to participate in the survey. This anonymous survey will not impact your standing as a Rowan student and it is not a requisite or requirement for courses.

The purpose of this research study is to determine how students use their faculty as a resource, and quantifies the link between student-faculty interaction and resource usage.

There are no risks or discomforts associated with this survey. **There may be no direct benefit to you**, however, by participating in this study, you may help us understand how students interact with and are educated by faculty.

The information you share in your response will be protected and made confidential for publication. **Your data will be de-identified during this process. We will store the data in a secure computer file and the file will be destroyed once the data has been published**. Any part of the research that is published as part of this study will not include your individual information. If you have any questions about the survey, you can contact the PI.This study has been approved by the IRB, PRO-2022-312.

Please complete the checkbox below.

To participate in this survey, you must be 18 years or older and a current undergraduate student of engineering at Rowan University.

[] Yes, I consent.

[] No, I do not consent.

Q2 What is your GPA?

[] 4.0 - 3.51

[] 3.5 - 3.01

[] 3.0 - 2.51

[] 2.5 - 2.01

[] 2.0 - 1.51

[] 1.5 - 1.01

[] 1.0 - 0.51

Q3 What is your race/ethnicity?

[] White or caucasian

[] Black or African American

[] Hispanic/Latino

[] American Indian or Alaskan Native

[] Asian

[] Native Hawaiian or Pacific Islander

[] Other _____

Q4 What is your age?

[] Under 18

[] 18 - 19

[] 20 - 21

[] 22 - 25

[] 25 -30

[] Over 30

Q5 What is your gender identity?

[] Male

[] Female

[] Non-binary / Third gender

[] Self-describe _____

[] Prefer not to say

Q6 Are you a transfer student?

[] Yes

[] No

Q7 Where do you live?

[] College affiliated housing[] Non college affiliated housing with other students

[] Non college affiliated housing without other students

Q8 Select which Engineering department you are a part of:

[] Mechanical

[] Electrical & Computer

[] Biomedical

[] Engineering Entrepreneurship

[] Chemical

[] Civil & Environmental

Q9 I feel socially connected to other students in my department:

[] Strongly Disagree

[] Disagree

[] Neither agree nor disagree

[] Agree

[] Strongly agree

Q10 I feel socially connected to other students outside of my department:

[] Strongly Disagree

[] Disagree

[] Neither agree nor disagree

[] Agree

[] Strongly agree

Q11 I have good relationships with the professors in my department.

[] Strongly Disagree

[] Disagree

[] Neither agree nor disagree

[] Agree

[] Strongly Agree

Q12 How often do you study/do work in a group setting?

[] Never

[] Sometimes

[] Often

[] Always

Q13 How often are you assigned group projects in your department?

[] Never

[] Sometimes

[] Often

[] Always

Q14 How often do you spend time with students from your department out of class time or outside of school-related activities?

[] Never

[] Sometimes

[] Often

[] Always

Q15 I am involved in clubs/activities in my department.

[] Strongly Disagree

[] Disagree

[] Neither agree nor disagree

[] Agree

[] Strongly agree

Q16 My department's culture is competitive.

[] Strongly Disagree (1)

[] Disagree (2)

[] Neither agree nor disagree (3)

[] Agree (4)

[] Strongly agree (5)

Q17 Who are your closest friends at this University (up to 10): Please DO NOT give full names, provide initials or nicknames.

Friend #1 _____

Friend #2 _____

Friend #3 _____

Friend #4 _____

Friend #5 _____

Friend #6 _____

Friend #7 _____

Friend #8 _____

Friend #9 _____

Friend #10 _____

Q18 What is their major?

	Mech Engr	Elec Engr	Civil Engr	Engr Entr	Chem Engr	Biomed Engr	Non Engr
Friend 1	[]	[]	[]	[]	[]	[]	[]
Friend 2	[]	[]	[]	[]	[]	[]	[]
Friend 3	[]	[]	[]	[]	[]	[]	[]
Friend 4	[]	[]	[]	[]	[]	[]	[]
Friend 5	[]	[]	[]	[]	[]	[]	[]
Friend 6	[]	[]	[]	[]	[]	[]	[]
Friend 7	[]	[]	[]	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]	[]	[]	[]

Q19 Do you work with or study with this person?

	Yes	No
Friend 1	[]	[]
Friend 2	[]	[]
Friend 3	[]	[]
Friend 4	[]	[]
Friend 5	[]	[]
Friend 6	[]	[]
Friend 7	[]	[]

Friend 8	[]	[]
Friend 9	[]	[]
Friend 10	[]	[]

Q20 What is their gender?

	Male	Female	Non-Binary	Prefer not to say
Friend 1	[]	[]	[]	[]
Friend 2	[]	[]	[]	[]
Friend 3	[]	[]	[]	[]
Friend 4	[]	[]	[]	[]
Friend 5	[]	[]	[]	[]
Friend 6	[]	[]	[]	[]
Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q21 Are they the same race/ethnicity as you?

	Yes	No	Unsure
Friend 1	[]	[]	[]
Friend 2	[]	[]	[]
Friend 3	[]	[]	[]
Friend 4	[]	[]	[]
Friend 5	[]	[]	[]

Friend 6	[]	[]	[]
Friend 7	[]	[]	[]
Friend 8	[]	[]	[]
Friend 9	[]	[]	[]
Friend 10	[]	[]	[]

Q22 Are they the same year in school as you?

	Yes	No	Unsure
Friend 1	[]	[]	[]
Friend 2	[]	[]	[]
Friend 3	[]	[]	[]
Friend 4	[]	[]	[]
Friend 5	[]	[]	[]
Friend 6	[]	[]	[]
Friend 7	[]	[]	[]
Friend 8	[]	[]	[]
Friend 9	[]	[]	[]
Friend 10	[]	[]	[]

Q23 Is Friend 1 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don’t Know
Friend 2	[]	[]	[]	[]
Friend 3	[]	[]	[]	[]
Friend 4	[]	[]	[]	[]

Friend 5	[]	[]	[]	[]
Friend 6	[]	[]	[]	[]
Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q24 Is Friend 2 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 3	[]	[]	[]	[]
Friend 4	[]	[]	[]	[]
Friend 5	[]	[]	[]	[]
Friend 6	[]	[]	[]	[]
Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q25 Is Friend 3 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 4	[]	[]	[]	[]
Friend 5	[]	[]	[]	[]
Friend 6	[]	[]	[]	[]

Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q26 Is Friend 4 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 5	[]	[]	[]	[]
Friend 6	[]	[]	[]	[]
Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q27 Is Friend 5 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 6	[]	[]	[]	[]
Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q28 Is Friend 6 friends with any of the following people?

	Strangers	Moderate	Close Friends	I Don't Know

		Friends		
Friend 7	[]	[]	[]	[]
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q29 Is Friend 7 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 8	[]	[]	[]	[]
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q30 Is Friend 8 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 9	[]	[]	[]	[]
Friend 10	[]	[]	[]	[]

Q31 Is Friend 9 friends with any of the following people?

	Strangers	Moderate Friends	Close Friends	I Don't Know
Friend 10	[]	[]	[]	[]

Q32 Please share any other thoughts on the culture of your department:

_____

_____