Strategies to Address Changes in Social Supports During the COVID-19 Pandemic

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Abstract

The pandemic of COVID-19 is disrupting engineering education globally, at all levels of education. While distance education is nothing new, the pandemic of COVID-19 forced instructors to rapidly move their courses online whether or not they had ever received prior training in online education. In particular, there is very little literature to guide instructors in supporting students in online engineering design or project-based courses. The purpose of this research is to examine engineering students' report of social support in their project and design-based courses at a large research university during the move to online instruction due to COVID-19 in the Spring 2020 semester and to provide recommendations for instructors teaching these types of courses online in the future. Our study is framed by social constructivism and social capital theory. We surveyed undergraduate engineering and engineering technology students (n=235) across undergraduate levels during the final week of the Spring 2019 semester. Survey questions included open-ended prompts about social supports and overall experience with the transition to online learning as well as name and resource generator questions focused on specific people and types of interactions that changed during the pandemic. We used qualitative content analysis of the open-ended responses along with comparisons of the name and resource generator to develop recommendations for instructors. Recommendations to increase students' social supports include: facilitating informal conversations between students and between students and the instructional team, grouping students located in the same time zones in teams, facilitating co-working sessions for students, establishing weekly structure, and utilizing some synchronous components (e.g., virtual office hours).

Introduction

The sudden shift from daily face-to-face interactions to online-only interactions necessitated by the public health threat of COVID-19 in March of 2020 left many students struggling to feel connected to campus and their courses. This shift was especially apparent in project or design-based courses in which students normally relied on face-to-face collaborative working time with team components. While transitioning a lecture-based course into an online format is fairly straight forward, project-based courses faced unique challenges. The social relationships and networks that are typically cultivated in project or design-based courses can be critical for navigating undergraduate education [1]. Social relationships help achieve key learning objectives in these courses, including design thinking, collaboration, and communication skills [2]. Although there are many established ways to communicate online, these do not replace the often-unplanned supportive interactions that happen in-person prior to the pandemic [3]- [5]. This sudden shift to online teaching could have implications for students' learning, persistence, and success. This necessitates the examination of students' social supports and relationships during this shift. In this paper, we make research-based preliminary recommendations for online teaching using data collected about students' social supports in team-project and design-based courses at a large research university.

We ground our recommendations in the Network Theory of Social Capital [6] and Social Constructivism as informed by Vygotsky [7]. Social capital is "resources gained from relationships" [6] that help an individual achieve a goal. In the Network Theory of Social Captial, there are two types of social capital—*expressive social capital and instrumental social capital [6]*. Lin attributes *expressive social capital* to resources related to "physical health, mental health and life satisfaction" (p. 244), including general emotional encouragement, empathy, and caring. On the other hand, *instrumental social capital* helps an individual achieve a goal through tangible resources or information. Social constructivism asserts that the process of learning is comprised of actively constructing knowledge by incorporating new information into their existing mental schemes; key tools of learning are social activity and language [8]. Learning is facilitated through purposeful social activity and meaningful feedback from someone more knowledgeable [7]. These theories suggest that relationships with peers and professors help engineering students persist by providing social capital in the form of significant emotional support and instrumental resources [1], [9], [10]. Effective social supports enable learners to move from accomplishing tasks with assistance to completing them independently [7]. The Community of Inquiry Framework [11] uses social constructivism to outline three important components within online courses that contribute to student development and learning: social presence, cognitive presence, and teaching presence. Social presence can be defined by the ability for group members to project themselves socially and emotionally, as "real" people (i.e., their full personality) [11]. Cognitive presence is the act of constructing meaning through sustained communication and is often developed through significant social presence [11]. The third component is teaching presence, which is how instructors design educational experiences to facilitate social and cognitive presence [11]. These theories framed our methods and analysis described in the following section.

Methods

We used a mixed methods approach, collecting survey data during the spring semester 2020 from two courses, a first-year engineering course and a capstone design engineering technology course. In the survey, we collected self-reported demographic data (Table 1), open-ended responses, and Name and Resource Generator responses [9].

Table 1. Students self-reported demographic information

		Percentage of students
Student level	1st year	56
	2nd year	13
	3rd year	12
	4th year	19
Gender	Female	34
	Male	64
	Transgender	1
Race/Ethnicity	American Indian/Alaska Native	1
	Asian	38
	Black/African American	1
	Hispanic/Latino	7
	Native Hawaiian/other Pacific Islander	1

White/Caucasian	59	
other race/ethnicity	3	

The students were asked the following open-ended questions:
1. How do you feel about courses being online because of COVID-19?
2. What challenges have you had?
3. What are you experiences with your courses this semester?
4. Tell us about how your interactions with instructors has been during this time. Are they similar or different than when the course was in person?
5. Tell us about how your interactions with other students in your courses have been during this time. Are they similar or different than in the past?
6. What, if any, positives have come about during this time of online instruction?

For the Name Generator, students were asked to identify the names of five people who they considered to be influential to their success and persistence in engineering and how these people supported them. For the Resource Generator, students were given a series of prompts (Figure 1) and asked to identify the groups of people who had supported them in these ways.

Q1	Provided you with financial support
Q2	Talked to you about their own work as an engineer
Q3	Gave you information about the type of work that engineers in your field do
Q4	Talked to about engineering career options
Q5	Encouraged you to stick your major in engineering
Q6	Gave you specific advice when you face an academic obstacle
Q7	Introduced you to people in their professional network
Q8	Helped you with the content your engineering courses
Q9	Helped you with a specific assignment (homework, project, etc.)
Q10	Recommended courses you should take
Q11	Gave you advice about your academic options
Q12	Gave you a good reference for a scholarship, job, or award
Q13	Alerted you to scholarship opportunities
Q14	Alerted you to job or graduate school opportunities
Q15	Told you about their own work as an engineer
Q16	Gave you general information about the type of work that engineers in your field do
Q17	Advised you or gives you specific information about the engineering curriculum at your school

Figure 1. Questions students were asked in the resource generator portion of the survey.

For the Resource Generator, students were asked to check boxes for each group of people who had supported them in each case and were able to select as many groups of people as were applicable to their experience. All survey data was collected in the final week of the Spring 2020 semester. In the same survey, students were asked to identify support from both before and during the pandemic.

The data analysis was conducted in two parts. First, we used the results from the Name and Resource Generator questions to count the total numbers of supports that students identified and make visual representations to demonstrate how these counts changed before and during the pandemic. For the qualitative results, we conducted a thematic analysis of the open-ended survey results [12]. Results of both parts of the analysis are included in the following section.

Results

Students reported decreased support during the pandemic (Figures 2 and 3), perhaps most notably in support from peers, university faculty and staff, and teaching assistants.
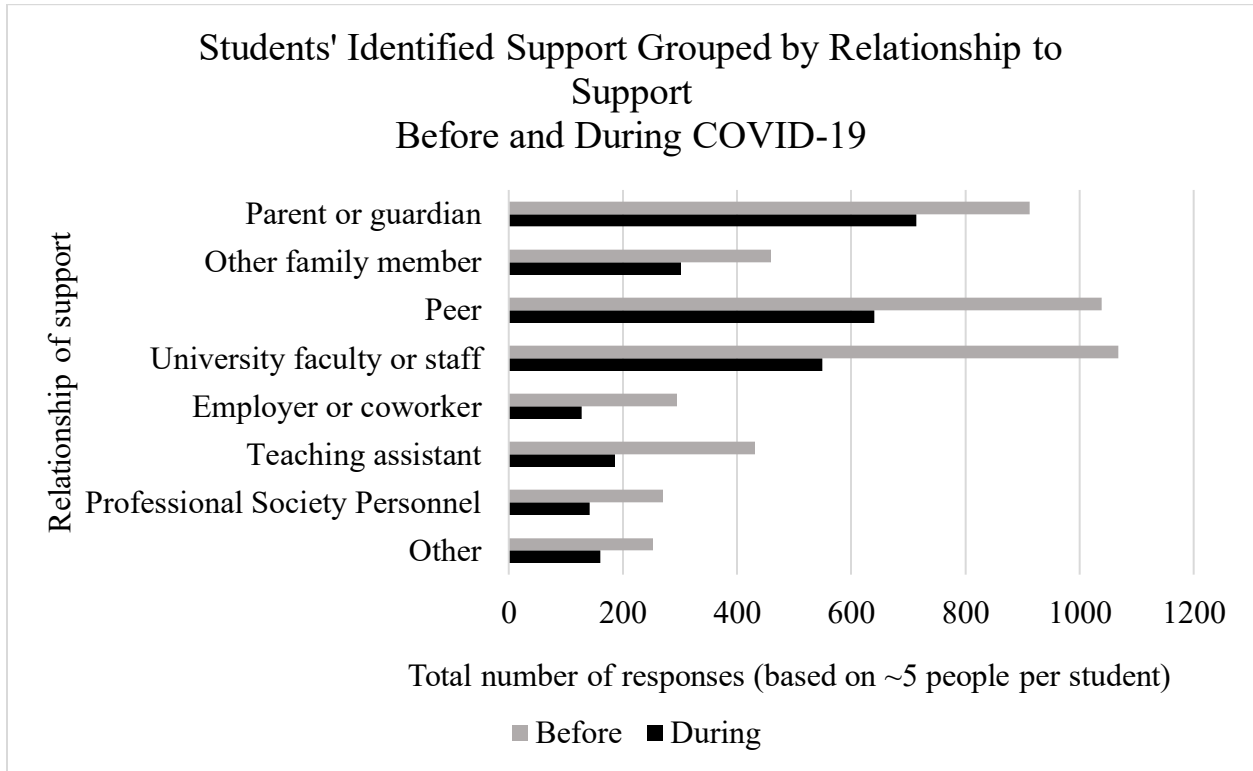

Figure 2. Students' identified support group by relationship to support
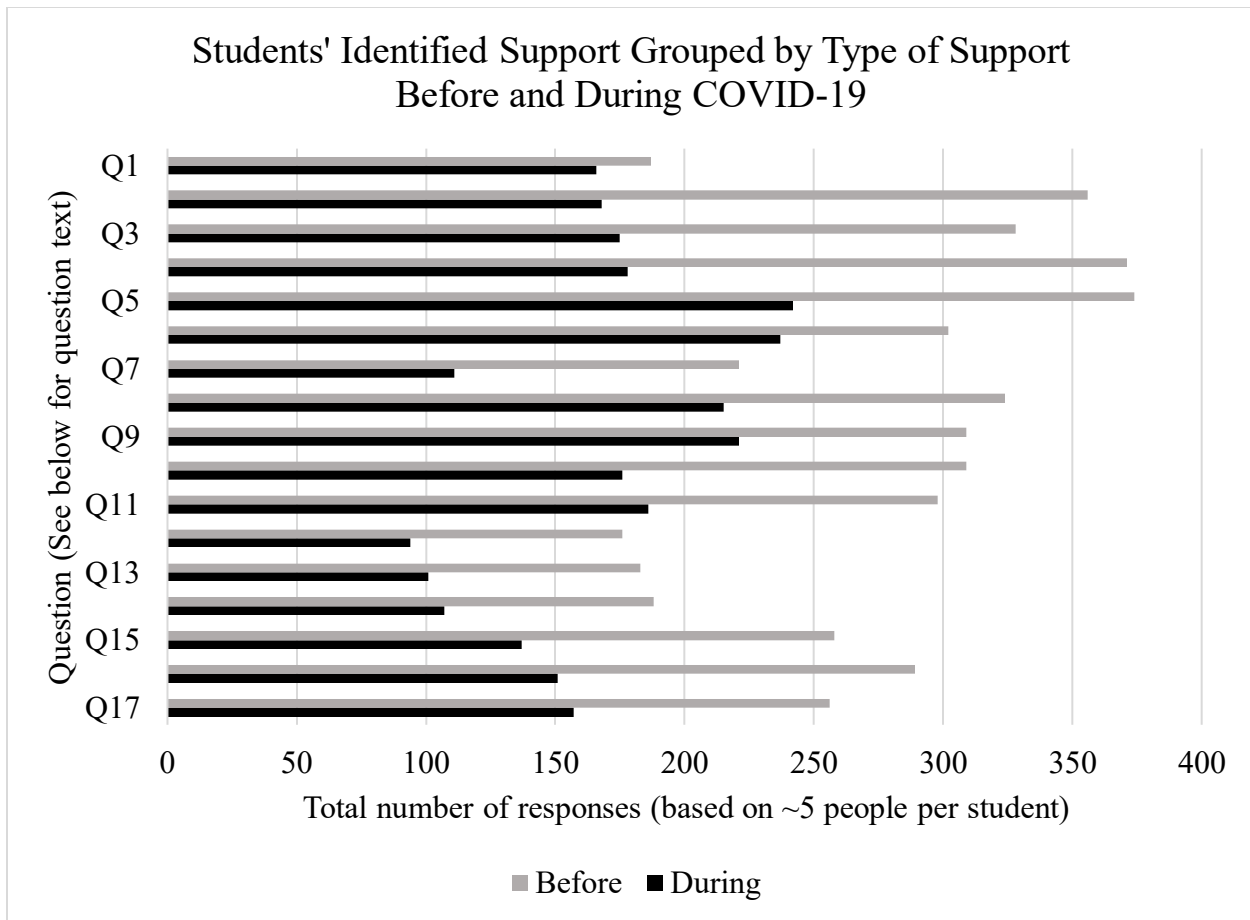
Figure 3. Students' identified support grouped by type of support

Common themes from the open-ended responses emerged regarding how students' social interactions and supports changed during the pandemic. Here we describe these themes using quotes from the students by situating them within the framework and give preliminary recommendations for strategies to support students' social support during remote instruction. See Figure 4 for a summary of recommendations.

Support Peer-to-Peer Interactions

The students reflected on how the pandemic impacted social interaction they had with their peers. Students expressed the value of peer support and how they missed face-to-face interactions with peers during the pandemic. For example, a student stated:

I had little interaction with other students [during the pandemic], except for my engineering group. This was quite a change from two months ago, when I studied with a group of friends every night. After moving to remote learning, I felt like I was pretty much on my own.

Other students said, "I had a class where we all engaged in group discussions periodically, so our professor had a couple of assignments where we messaged in small groups", and "the other students in my courses are the only reason I feel I passed my courses. They could explain difficult concepts in different ways than the instructors did which I understood MUCH better." These perspectives show the changes in social presence experienced by students during the shift to online. In order to facilitate this social presence, instructors must encourage meaningful peer

to peer interaction. Ways to support this social presence in team include: instructional teams could group students into semester-long groups and hold them accountable for meeting, establish virtual coworking times, and set up course wide- and team-wide communication tools.

Maintain Students' Motivations and Study Habits

Students talked of struggling with motivation, study habits, and time management after the shift to online learning. For example, students said, "My challenges include getting a schedule of what work needed to be done and finding motivation to do the school work since there was no one else to motivate me," "staying focused. . . having very little structured time has been very challenging," and "I've definitely become a lazier students because of it [the move to remote learning]." Another stated: "Motivation to learn and participate is infinitely more difficult when four out of six of my classes went to asynchronous learning. This is just not an effective way to learn unless the class is designed specifically around it." These changes in motivation and accountability can be attributed to a change in cognitive presence. Cognitive presence promotes stronger ties and promotes the development of relationships that help students exchange information and connect ideas [11]. In order to facilitate the cognitive presence, instructors must facilitate both social presence and teaching presence [11]. Instructors can do this by establishing a clear course structure and schedule, creating routines and have milestones for completion of large assignments, establishing at least some synchronous meeting times, and being proactive in reaching out to students.

Establish and Improve Instructor-Student Relationships

Students recognized differences in their interactions with their instructors during the pandemic. For example, students said, "I can't go up to my professor and ask follow up questions after lectures and have a conversation with them", "I did not once interact with any of my instructors live [after the move to remote learning]. I never got personal interaction, it was simply going between recorded lecture to homework", "[Challenges include] increased workload, harder. Questions not answered as quickly," and "They have given us ways to communicate with them but a lot of the time I don't understand their explanation and feel weird asking them twice." Maintaining teacher presence is essential is establishing strong cognitive presence. This teacher presence develops stronger ties that help students achieve educational outcomes because they feel more supported and have higher degrees of access to resources. Strategies to support teacher presence include having live discussions, maintaining scheduled virtual office hours, starting an online link 10 minutes early and staying additional 10 minutes, and setting expectations for time frames to expect feedback.

All together these results have implications for how to support students' social capital and develop communities of inquiry in online courses. Figure 4 displays a summary of recommendations for instructors based on our results.

Summary of recommendations to support social capital in team project-based courses	
In order to:	Try:
Support peer-to-peer interactions	• Establish virtual co-working times. • Utilize course-wide messaging tool (e.g., Slack, Discord, GroupMe) (without overwhelming students with too many platforms). • Use video conferencing with breakout rooms for teams to collaborate on projects. • Team students with classmates in the same time zone. • Support team communications for the whole student, not just the current project (e.g., encourage students to get to know their teammates personally).
Maintain students' motivations and study habits	• Establish structure and a routine that is clear to students (e.g. assignments, readings, videos, etc. due at consistent day and time). • Have some synchronous time (even if content is delivered asynchronously). • Have a clear, centralized platform to communicate assignments and keep it complete and up to date.
Establish and improve instructor-student relationships	• Proactively reach out to students – don't wait for problems to arise. • Give timely (and personal) feedback. • Tell students how you want them to ask questions (e.g., email, learning management system, messaging app, etc.) and when they can expect an answer back. • Host scheduled virtual office hours for students to join. It is more intimidating to request a meeting than to just know when the instructor is available and they can join. • Schedule synchronous class times to open a few minutes before and stay open a few minutes after class time and use the time to have conversations with students.

Figure 4. Summary of recommendations

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