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Community College Support for Engineering Students: Reflective Journaling Analysis

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Introduction

This research paper is a study on a subset of engineering students within a community college taking both Calculus and Physics during the same semester. We focus on this subset of engineering students as these course pairings are critical to these students moving forward in their engineering studies.

Community colleges play a critical role in preparing students to continue their education. Between 2010 and 2017, among U.S. students who earned bachelor's degrees in science and engineering, nearly half (47%) had done some coursework at a community college (National Science Board, 2020). Full-time undergraduates in the lowest income quartile are more likely to enter college at a community college than a 4-year institution and, despite lower costs of attendance, have the highest unmet need compared to other incomes (Pell Institute, 2018).

Our institution serves a diverse population of 20,000+ students each year. In AY 18-19, we had an average course retention rate of 86% and course completion rate of 75%. 81% of students were retained for at least the first year, and 62% completed their intended degree, certificate, or transfer outcomes - significantly higher than the national average for community colleges, where 62% are retained from year to year and just 26% earn a degree after six years. In 2018-19, the institution's STEM departments had 6,550 students considered low-income -- defined by our Community College District as eligible to receive the state's College Promise Grant. Of these students, 63% were successful in their STEM courses and 59% were retained the following year, a 22% gap in 1-year retention compared to the institution overall.

Although the retention rate is above average, there is data that shows students in critical course pairings, such as Physics 1—Calc 1 have a difficult time when taking both courses during the same semester, which is often the case for many STEM majors. There we investigate how students are utilizing support services to increase their academic achievements.

Literature Review and Theoretical Framework

Early studies on student retention heavily emphasized the role of an individual students' personality, abilities, motivation, and shortcomings (Berger et al, 2012; Habley et al, 2012; Tinto, 1993;). Vincent Tinto criticized these perspectives, instead widening the understanding of student retention to include environmental factors and context – including students' social status, class, income, and race/ethnicity. Tinto's paradigmatic Model of Institutional Departure (1993) provides a framework to better understand how the interactions between individuals and communities within an academic system lead student with different characteristics to persist or drop out. This framework highlights formal and informal student experiences regarding academic performance, faculty/staff interactions, extracurricular activities, and peer group interactions as critical factors in academic and social integration.

The Model of Co-Curricular Support (Lee & Matusovich, 2016) expands this idea of integration to not only academic and social, but professional and university-level domains. Furthermore, STEM learning communities have been found to be effective in facilitating student academic success and persistence by enhancing psychosocial learning factors (such as self-efficacy, STEM identity, academic self-regulation, and metacognition), interaction with faculty/STEM professionals, and interaction with peers (Carrino & Gerace, 2016).

While the Model of Institutional Departure and the MCCS both emphasize the role of social integration as a factor in student persistence and success, they are limited in understanding the needs of non-traditional commuter students, who frequently do not have the same level of peer interaction as traditional university students, and often have increased external responsibilities and family commitments (Bean & Metzner, 1985).

Current models and theoretical frameworks to understand student retention have several limitations including: they do not distinguish well between student withdrawal and institutional transfer (Tinto, 1982), many studies conducted using predominant models of student retention rely heavily on quantitative data and may not adequately capture qualitative data on student experiences (Jones, 2008; Ozga & Sukhnandan, 1997), and these studies have been primarily focused on traditional students at 4-year universities, with little data on commuter, part-time, older, low-income, or minority students at community colleges (Aljohani, 2016; Bean & Metzner, 1985).

We ground our research in the Model of Co-Curricular Support (MCCS) which suggests it is the role of the institution to provide the necessary support for integration. If students are aware and have access to resources, which lead to their success, then they will be more involved in the university environment at higher rates than those students who are not aware and have access to those resources.

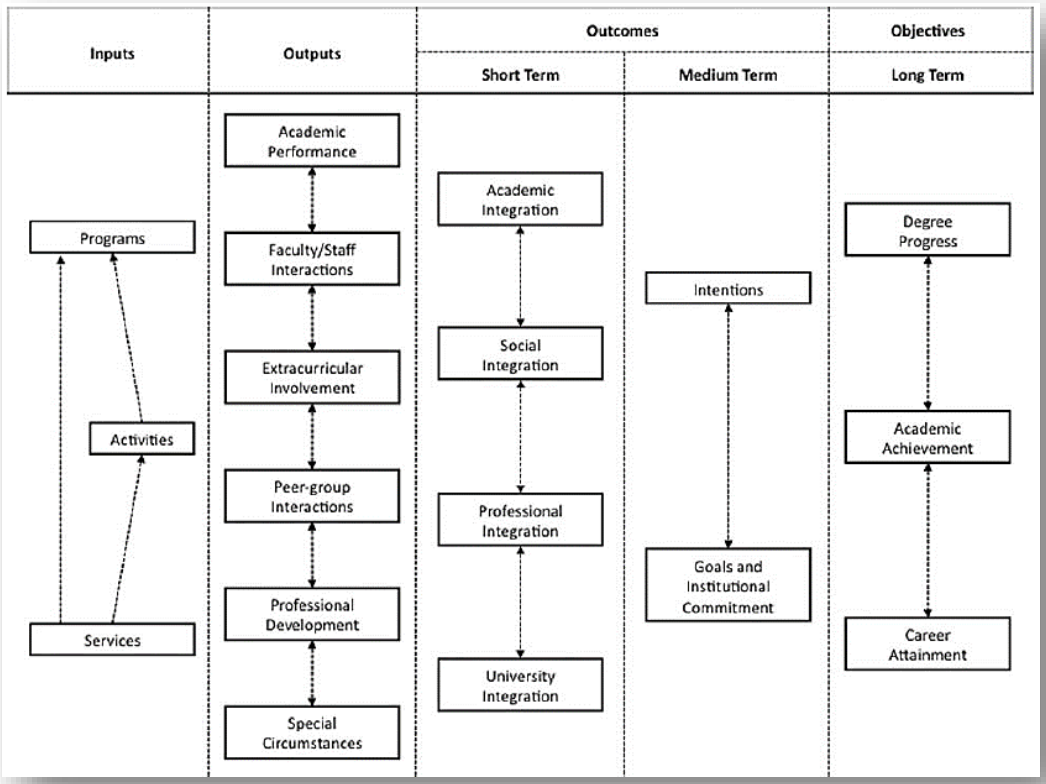


Figure1: Model of Co-Curricular Support

This research study focuses on answering one research question: How do engineering community college students engage with co-curricular supports as they progress through their degree programs? To answer this question, we recruited 20 students taking the critical course pairing of Calculus 1 and Physics 1 in the same semester to complete prompted reflective journaling assignments four times throughout a semester.

Research Study

Methods

In order to gain deeper insights into the ongoing lives and requirements of students, we implemented a reflective journaling approach to gather data from students about the assistance needed throughout the semester. This approach has been utilized before to collect similar data on nontraditional students in engineering (Brozina & Johri, 2022). To devise our reflective data collection tool, we drew upon the MCCS model previously discussed to generate prompts for participants. The ‘Outputs’ in Figure 1 were used to generate prompts for participants. In Figure 2, the prompts for the reflective journaling portion asked if students participated in a support area and if so to provide more details on what happened, or if they did not, why so.

Students could recall within a short time period their actions, thus the insights given were trustworthy. However, a limitation of using reflective journaling are that the data are provided by students who could provide limited information on their interactions. If the data does not have depth, then the analysis will not only be difficult but could prove ineffective.

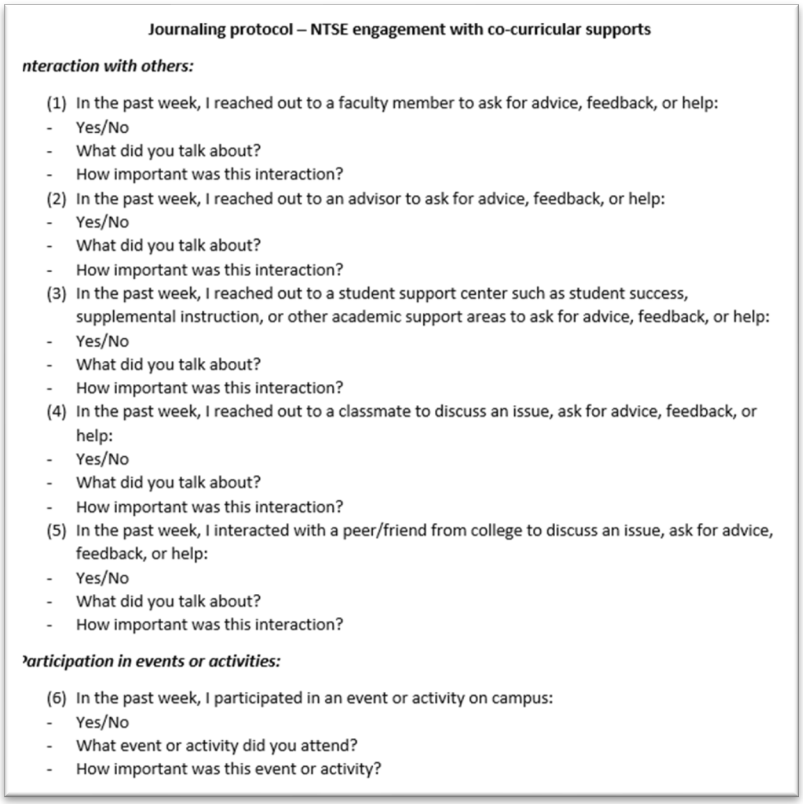
Data Collection

For this research study we recruited students to participate in reflective journaling entries throughout the Fall 2022 semester. The study site is a 2-year community college on the west coast offering engineering majors in Civil, Electrical & Computer, and Mechanical Engineering. 71% of students at the college have stated a long-term educational goal of transferring to a 4-year institution. Thirty students initially started the journaling exercise, but we narrowed down our dataset to include 20 students who not only gave consent to use their data for research but also completed at least two of the four reflective journaling assignments during the semester.

During the Fall 2022 semester study participants completed four journal reflection assignments. The four weeks of prompts asked students if they reached out to or participated with any of the following categories: (1) faculty, (2) advisors, (3) student support staff, (4) classmates, (5) peers/friends, and (6) campus events or activities. We also asked them to expand upon the interactions they had or did not have, as well as detail their importance and if it was a positive, negative, or neutral experience. Figure 2 above shows the reflective journaling protocol used.

Data Analysis

The focus of the analysis for this study is on the interactions students had or did not have with faculty, advisors, student support staff, classmates, peers/friends, and campus events or activities. The participants themselves selected whether the interaction was positive, neutral, or negative.



Journaling protocol – NTSE engagement with co-curricular supports

nteraction with others:

(1) In the past week, I reached out to a faculty member to ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(2) In the past week, I reached out to an advisor to ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(3) In the past week, I reached out to a student support center such as student success, supplemental instruction, or other academic support areas to ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(4) In the past week, I reached out to a classmate to discuss an issue, ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(5) In the past week, I interacted with a peer/friend from college to discuss an issue, ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

articipation in events or activities:

(6) In the past week, I participated in an event or activity on campus:
- Yes/No
- What event or activity did you attend?
- How important was this event or activity?

Figure 2: Reflective journaling prompts

Findings

Table 1 shows a heat map of whether or not participants engaged in the six categories during a particular week of their journaling reflections. Weeks that are left blank are instances when students did not complete the journal reflection. Many participants interacted with their classmates and friends/peers by far the most often. Interactions with faculty had the third most interactions, whereas advisors, student support, and campus involvement had little interaction from the participants.

Table 2 shows if there was an interaction how was it perceived by the participant. There were no interactions that were marked as a negative interaction, and few that were marked as a neutral interaction. An overwhelming majority of the interactions were selected to be a positive experience.

Table 1: Heat map of study participant and co-curricular support interactions

	Faculty Interactions					Advisor Interactions					Student Support Involvement			
ID	Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4
4	No		Yes			No		No			No		Yes	
6	Yes		No	No		No		No	No		No		No	Yes
7	Yes		Yes	Yes		Yes		No	No		No		Yes	No
8	No		Yes	No		No		Yes	No		Yes		Yes	No
9	No		Yes	Yes		Yes		Yes	No		No		Yes	No
10	No		No	No		Yes		No	Yes		No		Yes	No
12	Yes		No			No		No			No		Yes	
13	Yes	Yes	Yes			No	No	No			No	Yes	Yes	
14	No		No	Yes		No		No	Yes		No		No	No
15	No		No	No		No		No	No		Yes		No	No
16	No		Yes			No		Yes			No		No	
17	No		Yes			No		No			No		No	
18	Yes		Yes			Yes		No			No		No	
21	No	Yes	Yes	Yes		No	No	No	No		Yes	No	No	No
22	No		No	No		Yes		Yes	Yes		No		No	No
25	Yes		No	No		No		No	No		No		No	No
26	Yes		Yes			Yes		No			No		No	
27	Yes	No	Yes	Yes		No	No	No	No		No	No	No	No
28	Yes		Yes	No		No		No	No		Yes		Yes	No
29	Yes		Yes	Yes		No		No	Yes		No		Yes	No

	Classmate Interactions					Friend/Peer Interactions					Campus/Event Involvement			
ID	Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4
4	No		Yes			Yes		No			Yes		No	
6	Yes		Yes	Yes		No		Yes	Yes		No		No	No
7	Yes		Yes	Yes		Yes		No	No		No		No	No
8	Yes		No	Yes		Yes		Yes	No		No		No	No
9	No		Yes	Yes		Yes		Yes	Yes		No		Yes	Yes
10	Yes		Yes	Yes		No		Yes	Yes		No		Yes	Yes
12	Yes		Yes			Yes		No			No		No	
13	Yes	Yes	Yes			Yes	Yes	Yes			Yes	Yes	Yes	
14	Yes		Yes	Yes		No		No	No		No		No	No
15	Yes		Yes	Yes		No		Yes	Yes		Yes		No	No
16	Yes		Yes			Yes		Yes			No		No	
17	Yes		Yes			Yes		No			No		No	
18	No		No			Yes		Yes			No		No	
21	No	Yes	Yes	Yes		No	No	Yes	No		No	No	Yes	No
22	Yes		Yes	Yes		Yes		Yes	Yes		No		No	No
25	Yes		Yes	Yes		No		No	Yes		No		No	No
26	Yes		Yes			Yes		Yes			No		No	
27	Yes	Yes	Yes	Yes		No	Yes	Yes	Yes		Yes	No	No	No
28	No		Yes	Yes		No		No	Yes		No		No	No
29	No		Yes	Yes		No		No	No		No		No	No

Table 2: Responses if an interaction occurred

	Faculty Interactions					Advisor Interactions					Student Support Involvement			
ID	Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4
4			Positive										Neutral	
6	Positive													Positive
7	Positive		Positive	Positive		Positive							Positive	
8			Positive					Positive			Neutral		Positive	
9			Positive	Positive		Positive		Positive					Neutral	
10						Neutral			Neutral				Positive	
12	Positive												Positive	
13	Positive	Positive	Positive				Positive					Positive	Positive	
14				Positive					Positive					
15											Positive			
16			Positive					Neutral						
17			Positive											
18	Positive		Positive			Positive								
21		Positive	Positive	Positive							Positive	Positive		
22						Positive		Positive	Positive					
25	Positive													
26	Neutral		Positive			Positive								
27	Positive		Positive	Positive								Positive		
28	Positive		Positive								Neutral		Positive	
29	Neutral		Positive	Positive					Positive				Positive	

	Classmate Interactions					Friend/Peer Interactions					Campus/Event Involvement			
ID	Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4		Wk 1	Wk 2	Wk 3	Wk 4
4			Neutral			Neutral					Neutral			
6	Positive		Positive	Positive				Positive	Positive					
7	Positive		Positive	Positive		Positive								
8	Positive			Positive		Positive		Positive						
9			Positive	Positive		Positive		Positive	Positive				Positive	Positive
10	Positive		Positive	Positive				Positive	Positive				Positive	Positive
12	Positive		Positive			Positive								
13	Positive	Positive	Positive			Neutral	Positive	Positive			Positive	Positive	Positive	
14	Positive		Positive	Positive										
15	Positive		Positive	Positive				Positive	Positive		Neutral			
16	Positive		Positive			Positive		Positive						
17	Neutral		Neutral			Neutral								
18						Positive		Positive						
21		Positive	Positive	Positive				Positive					Neutral	
22	Neutral		Positive	Positive		Positive		Positive	Positive					
25	Positive		Neutral	Positive					Neutral					
26	Positive		Positive			Positive		Positive						
27	Positive	Positive	Positive	Positive			Positive	Positive	Positive		Positive			
28			Positive	Positive					Positive					
29			Positive	Positive										

Discussion

The Model of Co-Curricular Support delineates key facets such as academic performance, faculty/staff interactions, extracurricular involvement, peer group interactions, professional development, and other pertinent circumstances, which are deemed crucial for institutions to address in bolstering student support systems. However, given that the model originated from research conducted within traditional university settings, its applicability to the support requirements of engineering students in community colleges may be limited. Herein, we elucidate specific areas of interest derived from the analysis of reflective journaling responses

provided by 20 engineering students enrolled in community colleges. This analysis sheds light on their patterns of engagement with co-curricular support mechanisms, thereby addressing the research inquiry at hand.

Student interactions

Students interacted with their classmates by far the most out of any of the six groups. Of the 58 total responses 48, or over 80%, indicated they had an interaction with a classmate. Second most were 32 interactions with friends/peers, and third most were 31 interactions with faculty. Students interacting with their classmates the most is typical of any category of student, not just at the community college level. Therefore, it is important to have opportunities where students can be engaged with one another to build a sense of community and support.

Advising, student support, and campus events have limited engagement

The use of advisors, support staff, and campus events is limited with this group of engineering community college students. There is a great opportunity to provide students with easier access to these resources, especially connecting them with advisors and on-campus student support. One participant mentioned, “since I am doing many assignments and other work, I have no time to visit the support center and I think I am doing great so far, so I do not need any help. When I have questions or need help I will definitely go to support center personnel and get help.” This is representative of most students on why they do not attend any student success hubs, supplemental instruction, or learning communities to ask for advice, feedback, or help. It will be important to continually provide students with opportunities to receive additional help, however the logistical barrier must be taken into consideration when doing so. There may be opportunities in class to get students the additional assistance they need to be successful.

Conclusion

Our findings from a study of community college students in engineering and their interactions with various entities around campus showcase the limited time of students and the need to develop support systems directly tailored to community college students. Our goal was to determine what supports community college students utilized as well as what happened within those interactions. Participants in our study connected with other classmates most of the time, as well as faculty and other peers. Students did not utilize formal support services often. Community college students juggling multiple life experiences and events have limited time and thus it is imperative to create systems that work for them and their situations.

Limitations

The limitations of the study are that this is just one small subset of community college students studying engineering and that the data cannot be extrapolated for all students. Additionally, there were only four weeks where feedback was received for the journal reflections; these could have

been weeks in which there were less opportunities for students to connect with faculty, students, and university services.

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