WIP: Promoting Undergraduate Student Success through Faculty Mentoring

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Introduction

As previous studies recognize, the transition from school to college often requires a support system for students[1]. In engineering education, mentoring plays a crucial role in student success by providing personalized guidance and fostering a sense of community[2]. Mentors typically assist with academic challenges, decision-making, and personal development. While most research focuses on mentoring for research activities, there is also a need for general advising on course selection, internships, and personal concerns [3].

This work in progress explores the needs and expectations of students in a faculty mentoring program within an Electrical and Computer Engineering department at a large public university. The program aims to offer personalized support to students by providing guidance and peer mentoring to enhance retention and self-esteem [4].

Each semester, a faculty member serving as a mentor schedules meetings with their assigned students. During these meetings, the mentor offers guidance and advice on educational matters and career goals, including research and internship opportunities, as well as study abroad possibilities. This support is particularly crucial during the early years of college, when students often lack a research mentor, are unaware of the full range of resources available from the department and the university, and can feel overwhelmed by the abundance of information. For the advice on ECE curricula, courses, and related questions, students typically consult with the general departmental academic advising service, which is dedicated to addressing curriculum-related questions.

Faculty members are typically assigned approximately 30-35 students from various academic levels. Most students are matched with a faculty mentor starting in their freshman year and continue this mentor-mentee relationship until they graduate. If the initial pairing is not effective, students have the option to select a different faculty mentor. It's worth noting that a faculty mentor's research specialization may not always align with the mentee's area of interest.

Currently, students must schedule one mandatory meeting per semester until their graduating semester. However, they can always reach out to faculty if they need additional meetings beyond the required one. Students are responsible for scheduling appointments based on faculty members' availability calendars, which are made available before each semester's meeting period.

Faculty have the flexibility to choose how they conduct these meetings. They can opt for

one-on-one private conversations or group sessions, and meetings can be held either in person or online. Additionally, faculty can decide on the duration of the meetings, ranging from 15 to 60 minutes. However, there is a lack of clear guidance or information on students' preferences regarding the meeting format, common questions, expectations or appropriate meeting duration. This ambiguity can be challenging for both faculty and students. Faculty may struggle to provide the most effective support, while students often fail to grasp the purpose of these meetings, viewing them as a "silly requirement" rather than a valuable source of assistance.

Methodology

In the initial phase of this work in progress three ECE faculty members held one-on-one, in-person meetings with their mentees. After these meetings, mentees were invited to complete an online survey about their mentoring experiences and preferences. The survey focused on seven main areas: student expectations, the level of support received, comfort in discussing academic and non-academic topics, logistical considerations, stress levels, and suggestions for improvements. Most questions were rated on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), while six questions were designed to be open-ended. The survey questions and their categorization are presented in Table 1 [5].

Question #	Question	Category
Q1	First and last name?	Student information
Q2	Who is your mentor?	
Q3	What was the format of the mentoring meeting?	
Q4	If you had a group meeting, how many other students were in the group?	
Q5	To what extent has the mentoring meeting met your expectations?	Student expectations
Q6	How supportive has your faculty mentor been about your professional goals?	Level of support
Q7	How supportive has your faculty mentor been about your academic goals?	
Q8	How supportive has your faculty mentor been about your life goals?	
Q9	How easy has it been to discuss ideas about elective options with your faculty mentor?	Comfort level in academic topics discussion
Q10	How easy has it been to discuss ideas about career options with your faculty mentor?	
Q11	How easy has it been to discuss ideas about internship options with your faculty mentor?	
Q12	How easy has it been to discuss ideas about research options with your faculty mentor?	
Q13	How helpful has your faculty mentor been in balancing your class schedule with other obligations?	Non-academic topics
Q14	How well has your faculty mentor helped you in developing better time management skills?	
Q15	In general, how helpful have you found the mentoring meeting?	
Q16	Please explain your answer to the question above (open-ended)	
Q17	Has the allocated time been sufficient to address all your questions?	Logistics
Q18	Do you think the mentoring meetings should be optional? Why or why not? (open-ended)	
Q19	How often do you think mentoring meetings should be held?	
Q20	Which type of mentoring meeting do you prefer?	
Q21	How stressful has it been to talk to your mentor?	Level of stress
Q22	How stressful has it been to come up with questions before the meeting?	
Q23	What topics would you like to discuss during mentoring meetings?	Suggestions/ improvements (open-ended)
Q24	What resources do you think your mentor should provide during mentoring meetings?	
Q25	What else would you like to address during the mentoring meeting?	
Q26	How can the mentoring meetings be more beneficial for you?	

Table 1: Categorized survey questions.

In the second phase of the work, five faculty members participated. Some faculty opted to meet one-on-one, while others provided students with the opportunity to choose between in-person one-on-one meetings and small group meetings (up to 5 students). Students were allowed to self-assign to any available time slot on a first-come, first-serve basis. However, they could not

see the identities of other assigned members. The faculty set various options for the duration of the meetings. At the end of each meeting, the students were asked to complete the survey again to reflect on their experience. Overall, 40 students participated in the survey. Next, the Independent Samples t-Tests, Analysis of Variance (ANOVA), Chi-square test and Kruskal-Wallis H test were conducted using IBM SPSS [6] to determine if there were significant differences in responses.

Findings

Findings on preferred meeting format

First, we examine the relationship between mentoring format students experienced(Q3) and students' preferences for mentoring formats (Q20). Q3 asked students to report whether they participated in group mentoring (coded as 1) or one-on-one mentoring format (coded as 2). Q20 asked students about their preference for mentoring formats, ranging from "I much prefer group meetings" to "I much prefer one-on-one meetings." The cross-tabulation results are shown in Table 2.

	Preference	**Q3 (Experienced Mentoring Format)**		**Total**
		Group (1)	**One-on-One (2)**	
Q20 (Preference for Mentoring Format)	Much prefer group (1)	10	0	10
	Somewhat prefer group (2)	4	1	5
	Neutral (3)	5	5	10
	Somewhat prefer one-on-one (4)	0	5	5
	Much prefer one-on-one (5)	1	9	10
Total		20	20	40

Table 2: Cross-tabulation of Experienced Mentoring Format (Q3) and Preferences (Q20).

The results indicate that 14 out of 20 students who participated in group mentoring (Q3=1) expressed a preference for group meetings, choosing either "Much prefer group" or "Somewhat prefer group". Similarly, 14 out of 20 students who experienced one-on-one mentoring (Q3=2) showed a preference for one-on-one meetings.

However, some mismatches were observed in both groups. One student in group mentoring selected "Much prefer one-on-one meetings" (Q20 = 5), while one student in one-on-one mentoring selected "Somewhat prefer group meetings" (Q20 = 2). In addition, a total of 10 students in both groups reported "No preference" in the mentoring format.

Next, a Chi-square test was conducted to determibe if the relationship between mentoring format and preferences was statistically significant ($\chi^2(4) = 23.200, p < 0.001$). The results indicate that students generally prefer the mentoring format they experienced. Specifically, 70% of students in group mentoring prefer group meetings, and 70% of students in one-on-one mentoring prefer one-on-one meetings.

While there is a bias toward attending and preferring certain meeting format, it is important to note that only 70% of participants expressed a preference for the format they have experienced,

not 100%. This highlights the variability in individual preferences, suggesting that some students may have opted for individual sessions instead of group ones, or vice versa, based on their personal schedules. It is also worth noting that random assignment to group or individual formats would reduce bias, but such an approach would not be feasible due to the conflicting schedules of the students. Thus, the scheduling constraints must be taken into account when interpreting these preferences.

Interesting to note that 25% of students in both groups reported having "No preference", suggesting that while the mentoring format is important, other factors also play a role. These factors may include how the mentor explains ideas, how students feel about their mentor,and the structure of the sessions. These findings suggest that offering flexible mentoring format options could work better to accommodate diverse student needs.

Next, we analyze the distribution of students' preferences for mentoring formats (Q20) across group sizes (Q4). The results are shown in Figure 1.

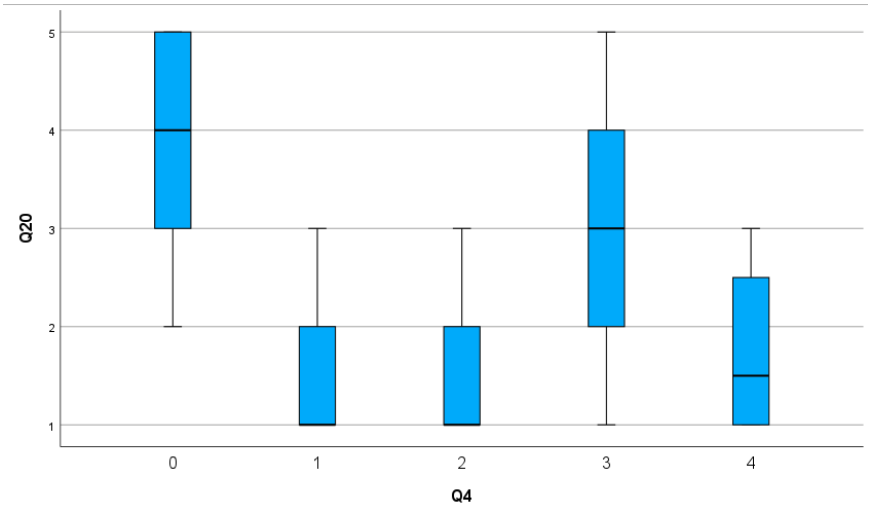

Figure 1: Students' preferences for mentoring format (Q20) by group size (Q4). Note that Q4=0 indicates one-on-one meeting and Q4=1,2,3 and 4 correspond to the number of students in the group meeting.

Students in one-on-one meetings (Q4 = 0) showed a strong preference for one-on-one mentoring, with a median of 5 ('I much prefer one-on-one meetings'). Preferences for group meetings were lower in smaller groups (Q4 = 1 and 2) and showed more variability in larger groups (Q4 = 3 and 4). This trend suggests that group size influences preferences for mentoring formats.

Next, a one-way ANOVA was performed to examine whether there is a relationship between group size (Q4 = 1–4) and the student preferences for mentoring formats (Q20). Therefore, data from students who participated in individual meetings (Q4 = 0) were excluded from the analysis. The analysis shows that there are no statistically significant differences in preferences between group sizes ($p = 0.177$, which is greater than 0.05).

It is important to note that the sample size for this analysis was limited, with only 20 observations in four group sizes, which may have affected the statistical power and generalizability of the

results. Overall, the findings suggest that the size of the group does not strongly influence the preferences for group mentoring formats.

Findings on preferred meeting duration

The next research question we explore is ”Does the perception of time sufficiency (Q17) vary across mentoring formats (Q3: Group vs. One-on-One)?”

We conducted ANOVA analysis to examine whether perceptions of time sufficiency (Q17, with 5 meant too long and 1 meant too short) differed with respect to mentoring format (Q3). The results showed no statistically significant difference in time sufficiency between mentoring formats with $F(1, 38) = 1.754$, and $p = 0.193$.

Descriptive statistics reveal that students in group meetings reported slightly higher perceptions of time sufficiency (mean = 3.35, standard deviation (SD) = 0.671) compared to those in one-on-one meetings (mean = 3.05, SD = 0.759). For students in one-on-one meetings, the mean of 3.05 indicates that the time allotted (15 minutes) was perceived as ”just about right.” In contrast, for group meetings, the mean of 3.35 suggests that a meeting time of 45 minutes was perceived as leaning slightly toward ”somewhat too long”. However, this difference was not statistically significant, as indicated by the small effect size ($\eta^2 = 0.044$). This finding suggests that the mentoring format explains only 4.4% of the variance in perceptions of time sufficiency. Figure 2 highlights this small difference, with group mentoring depicting a marginally higher mean perception of time sufficiency compared to one-on-one mentoring.

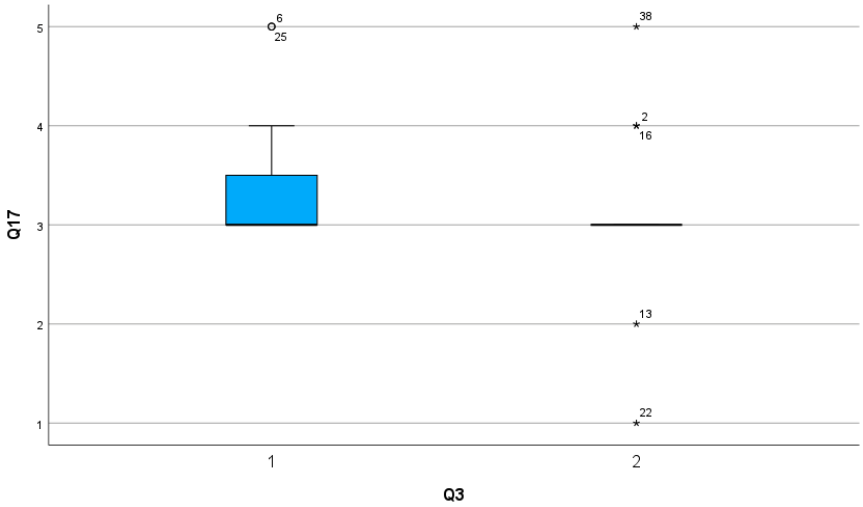

Figure 2: Students’ preferences for mentoring time (Q17) by mentoring format (Q3), where Q17 was rated on a Likert scale with 1 (much too short), 2 (somewhat too short), 3 (just right), 4 (somewhat too long) and 5 (much too long).

Furthermore, a few outliers were observed in the plot (shown as student ID numbers), indicating that some students rated their perceptions of time sufficiency as very high or very low, regardless of the mentoring format.

Findings on preferred attendance format

Here, we qualitatively analyze the responses to Q18 (”Do you think the mentoring meetings should be optional? Why or why not?”). The open-ended responses from the students were merged into three main themes: mandatory, optional, and conditional.

- **Preference for mandatory meetings:**

  Approximately 71.0% of the students support mandatory mentoring meetings. They highlighted the importance of these meetings for providing guidance and building connections with faculty. For instance, one student stated, *”I think it should be mandatory to do a check-in with the students,”* while another noted, *”Mandatory, so that students can avail this opportunity to learn more about useful resources on campus and potentially sharpen their professional/personal goal plans.”* Another student added, *”I think that they should be mandatory because there are many students that would benefit greatly from these meetings, but would never sign up if it was optional.”*

- **Preference for optional meetings:**

  Approximately 23.7% of the students prefer optional meetings. One student commented, *”I think they should be optional, as students who find them helpful would attend”*. Another suggested, *”Making it optional could save the faculty and students time”*.

- **Preference for conditional meetings:**

  Approximately 5.2% of the students favor a conditional approach. One student commented, *”I think they should become optional once the student becomes a junior/senior. I think it is essential for underclassmen to form a relationship and have guidance”*. Another student stated, *”I think they should be optional but held more frequently, just like advising sessions”*.

These findings suggest that the majority of students prefer mandatory mentoring meetings, emphasizing the value of faculty support during these sessions. However, some students prefer optional meetings, particularly those who are already proactive in seeking help.

Findings on preferred meeting frequency

Next, we examine the most common preferences for mentoring meeting frequency (Q19). Students could choose from the following options: once a month, once a semester, or once a year. We also considered responses to Q18 regarding whether mentoring meetings should be optional. The results are shown in Figure 3.

The findings suggest that most students prefer mentoring meetings to be mandatory and held once a semester, with approximately 65% of respondents selecting this option. This was followed by the ”once a year” option, chosen by around 25% of students. The least popular options were ”once a month” and ”optional”, each selected by less than 5% of students. Therefore, students strongly prefer mentoring meetings to be mandatory and scheduled at moderate intervals, such as once per semester, rather than more frequent or optional meetings.

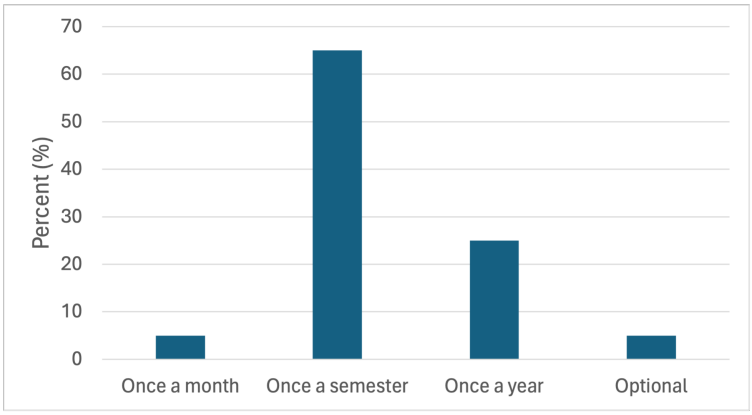

Figure 3: Students' preferred frequency for mentoring meetings (Q19).

Findings on students' satisfaction

Finally, we examine the research question: "Does satisfaction with mentoring meetings (Q5) differ based on students' preferred frequency of mentoring meetings (Q19)?"

We performed a Kruskal-Wallis H test to determine whether there are differences in satisfaction levels (Q5) across preferred meeting frequencies (Q19). The analysis revealed no statistically significant differences in satisfaction levels between the groups ($p = 0.222$, $p > 0.05$). Therefore, the students' satisfaction with the mentoring meetings is not affected by their preferred meeting frequency.

Discussion on Faculty Perspective

From the faculty perspective, the usefulness of mandatory meetings depends on the students' level. For instance, mandatory meetings may be more valuable for freshmen and sophomore students than for more senior students, as younger students may not yet have developed strong time management skills or become familiar with college resources. Making meetings mandatory can help these students stay on track. In contrast, senior students often have a clearer understanding of their future plans and are generally better at managing their schedules, so optional meetings may be more beneficial for them.

It was also observed that while different faculty members might prefer various formats for meetings, having students meet in groups could better fit into their work schedules. Moreover, group settings allow the mentor to act as a moderator, guiding students' questions and encouraging discussions. Students might be more receptive to advice from their peers rather than the professor. Additionally, faculty might gain a better understanding about students' experiences in different courses and activities in group settings, as students often feel more comfortable discussing these matters with peers rather than with faculty.

Another observation is that group meetings can reduce stress for students, as they may feel more comfortable among their peers compared to individual face-to-face meetings with the mentor. Nevertheless, it is important to always provide an opportunity for students to choose individual meetings to discuss private or sensitive topics.

Limitations and Future Directions

In this section, we discuss the constraints and future directions of the presented work in progress. One limitation is the potential bias introduced by the inability to randomly assign students to groups or one-on-one sessions due to scheduling constraints. Another limitation is the current sample size, which remains small as the research is still in its early stages. However, with the strong support from the department head, we plan to expand the study to include the entire department in future iterations. Ultimately, our goal is to develop comprehensive guidelines for mentoring sessions. These guidelines will be especially valuable for new faculty members to conduct effective mentoring sessions from the start, thereby improving the overall mentoring process. Furthermore, this mentoring approach has the potential to be adopted by other departments and universities to better address students' needs and improve their overall experience.

Conclusions

This work in progress provides insights into the experiences and preferences of undergraduate students participating in a mandatory mentoring program within the Electrical and Computer Engineering department at a large public university. The study highlights key factors influencing the effectiveness of mentoring relationships, particularly regarding meeting formats, frequencies, and logistical considerations.

The findings indicate that students' preferences for mentoring formats are influenced by their prior experiences. 70% of those who participated in group mentoring tend to prefer group settings, while 70% of those in one-on-one mentoring favor individual meetings. However, a small portion of students expressed a preference for the alternative format or reported no strong preference, suggesting that flexibility in mentoring structures may be beneficial. Additionally, the size of mentoring groups does not appear to significantly impact student preferences.

Additionally, the research indicates that the perceived sufficiency of meeting time does not differ significantly between group and one-on-one mentoring, suggesting that both formats can be effective when managed appropriately. The preferred frequency for mentoring meetings is once per semester, with students expressing a strong preference for mandatory meetings scheduled at moderate intervals rather than more frequent or optional sessions. Importantly, no significant differences in student satisfaction were observed based on their preferred meeting frequency. Future research will continue to explore these dynamics to further improve mentoring practices.

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