Faculty Perceptions of Student Engagement: A Qualitative Inquiry

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Engineering Faculty Perceptions of Student Engagement

Introduction

There is a national concern about the relatively large proportion of students who leave engineering programs. Even with tremendous efforts in place such as summer bridge programs, learning communities, mentoring programs, integrating authentic problems and projects in curricula, etc., key trends have not changed, and retention rates still range from only 40% to 60% for the majority of engineering programs[1]. Researchers conducted the present study at a university with retention rates similar to national averages.

Numerous studies focusing on the persistence problem have suggested that attrition is related to student engagement [2, 3]. Ohland and colleagues[4] published an influential study of demographic and engagement-related factors related to engineering student persistence. Using data from nearly 70,000 students at nine institutions, they found that student engagement is often essential to persistence. Not surprisingly, students who quickly disengage from their engineering coursework are much more likely to end up switching out. A more surprising outcome is that even those who do persist and graduate with an engineering degree typically become less and less engaged with engineering classes over the course of their program, a finding that was replicated by Eris and colleagues two years later[5]. This is a troubling reality for dedicated engineering educators who would hope to see engagement *increase* as students develop an engineering identity and become more confident in their professional skills.

Student engagement is comprised of factors such as collaborative learning, participation in academic experiences, communication with faculty, and feeling supported by the institution[6]. Researchers studying school engagement have proposed a multifaceted model that includes behavioral, cognitive, and emotional domains[7]. Behavioral engagement represents students' participation and involvement in academic and extracurricular activities that will have a positive impact in their academic achievement. Cognitive engagement encompasses willingness to succeed academically and mastering the material. Emotional engagement is described as the positive and negative feelings and attitudes students have toward professors, peers, the content and the institution. While there are numerous ways toconceptualize student engagement, influential scholar George Kuh defines it as "the time and effort students devote to activities that are empirically linked to desired outcomes of college *and* what institutions do to induce students to participate in these activities"[8]. Interestingly, when describing student engagement, Kuh proposes that both students and their institutions should be held accountable. Accordingly, research shows that faculty and staff play a central role in student engagement [9, 10, 11, 12, 3]. Umbach and Wawrzkynski, for instance, found that the academic environment created by the faculty and the institution has a "dramatic effect on student learning and engagement"[13]. Institutions with faculty members who value enriching educational experiences, interact with students, utilize active and collaborative learning, and emphasize higher-order cognitive activities, have students who report higher levels of engagement and learning[3].

Although research consistently supports the importance of faculty to student engagement, the literature also suggests that there may be key differences in faculty's perceptions of the role they play in engaging students[14]. Some departments appear to have established a culture of student

engagement and maintain active initiatives to sustain such a culture, while other departments lack the knowledge and formal establishment of a culture of student engagement[3]. The aim of this study, thus, is to explore the culture of student engagement at anengineering department within a medium-sized comprehensive university in the Mid-Atlantic and to compare this culture to findings of other similar efforts as described in published literature. Specifically, we targeted engineering faculty to gain insight into faculty's perceptions of student engagement. The engineering department at this university has fourteen full-time faculty members, nine of whom participated in this study. Being a relatively new engineering program, cultural development is an ongoing process, making this study meaningful at the departmental level.

Four research questions grounded this effort:

RQ1: How are engineering faculty members perceiving and defining *student success*? Specifically, do engineering faculty consider *student success* and *student engagement* to be related and how?
RQ2: How are engineering faculty members characterizing an *engaged student*?
RQ3: What are engineering faculty members doing to establish, maintain, or increase *student engagement*?
RQ4: How do engineering faculty members perceive their role and the department's role in promoting and maintaining *student engagement* in comparison to the role students have?

Previous Literature on Engagement

Previous research suggests that engagement expresses a complex but positive relationship with persistence[15, 4]. For example, the aforementioned Ohland and colleagues'[4] study used NSSE data to show that while disengagement increases over time in both persistent and non-persistent students, those who *persist* in engineering programs becomedisengaged more gradually than their *non-persisting* counterparts. Hu and McCormick[15] developed a typology of students based on different types of engagement behaviors to assess which behaviors correlate with certain metrics of successas determined by the NSSE (Academic Challenge, Active and Collaborative Learning, Student-Faculty Interaction, Enriching Educational Experiences, and Supportive Campus Environment). Students that scored differently on certain NSSE benchmarks were classified accordingly, namely as "Unconventionals," "Maximizers," "Grinds," and "Conventionals," "Disengaged," "Collegiates," and "Academics," according to their habits involving specified engagement related behaviors. These profiles match behavioral patterns of the common tropes of university students. For example, "Grinds" were below average on all benchmarks except for "academic challenge," indicating that these students were engaged with schoolwork and were not able to devote time and energy to being engaged outside of what was required for classes. Conversely, "Collegiates" were below average on all benchmarks except for "supportive campus environment," indicating that they devoted most of their resources to engaging with campus culture and institutional programs, but did not engage academically or professionally.Certain types of students were shown to make significantly different levels of personal and academic gains via scoring significantly higher on a Total Direct Assessment gain scale.

The next vital step in engagement research is determining how faculty factor in the student engagement equation. According to Umbach and Wawrzynski[3], both institutional policies and faculty's attitudes focused on increasing student engagement are positively correlated with significantly higher rates of student engagement behaviors. Interestingly, Pan and Gauvain[16] noted that while faculty members do play a role in student engagement, that role seems to change over the time. Specifically, students' perceived institutional support only made a significant impact on students' academic motivation during freshmen year. Current literature in the fields of student engagement and institutional assessment, thus, attempts to delineate the nature of the role of faculty in engagement. Coates[17], for example, noted that understanding student engagement is a vital factor in assessing the quality of any educational experience. Noted in this article is the idea that student-faculty interaction is an unavoidably critical part in assessing the true nature of student engagement, which leads to concerns about the qualities and machinations of something that goes largely unregulated and uncoordinated. Further attempts to discover the current nature of the role of faculty and engagement has led to the development and more consistent use of a faculty-based version of the National Survey of Student Engagement (NSSE) – The Faculty Survey of Student Engagement (FSSE). TheFSSE endeavor has led to a wide variety of publications including civic engagement, diversifying campus experiences, teaching clarity, quantitative reasoning, and faculty professional development, among others. It provides data collected on over 145 institutions and 18,000 faculty members, which get published annually for researchers to analyze and use as a reliable and accredited means of observing faculty in a nearly comprehensive lens of their professional environment.

Although literature suggests that faculty and staff play an essential role in student engagement, some studies suggest that faculty have different approaches to student engagement[18, 12, 2,14]. Trowler and Wareham[19] have noted that different teaching methods and ideologies can greatly influence the way engagement is perceived, valued, and achieved. Through a mixture of literature review and case study, they found that differing explicit educational ideologies have self-contained norms about what engagement is in the context of teaching and research, as well as how it is to be achieved and maintained. Specifically, there were four main teaching ideologies found: Traditionalism (in which teaching is treated as dissemination of knowledge), Progressivism (in which teaching is understood as developing students' autonomy), Social Reconstructionism (in which teaching encourages students to become critical and active thinkers), and Enterprise (in which teaching involves equipping students with skills required to thrive in their respective fields. Within each of these contexts, engagement is not only defined slightly differently each time, but the way the faculty are presupposed to lead the students towards engagement is different as well. In another interesting study, Rotter[20] found that common perceptions of average students in different majors vary greatly in terms of perceived values and personality characteristics. This reflects not only the general tendencies of students who gravitate towards each major, but also shows how the faculty in different fields tends to shape their students. For example, the findings in this study suggest that engineering students are perceived to be more independent and perseverant, and that faculty in engineering departments tends to encourage students to have independent academic pursuits and persevere through difficult projects as a more ideal form of engagement than their counterparts in other fields. This especially speaks to student engagement as a factor of the culture of a department. If the culture of a department as demonstrated by the faculty (i.e. faculty perspectives, opportunities provided by faculty, etc.) provides encouragement and incentives to students who are looking to become

engaged, those students will usually follow suit, and it is shown that cultural methodologies are diverse enough that student engagement in one department may not necessarily translate to another. In the context of STEM education, Laird and colleagues[21] found that, in general, non-STEM fields are better at engaging students compared to STEM fields, and that STEM fields, while not disregarding student engagement, are not engaging students in certain vital facets and methodologies. For example, this study found that the non-STEM students were more engaged in Integrative Learning and Reflective Learning 92% of the time. Alternatively, STEM students tended to engage more in Active and Collaborative Learning than non-STEM students, but the effect size for this finding was drastically less. These findings suggest that attitudes, policies, strategies, and behaviors all intertwine at the faculty level to provide dynamic environments for student learning. Such environments cannot be optimized without further consideration of faculty roles, attitudes, and values concerning student engagement. In that sense, it is important to study faculty's own perspectives on student engagement, as well as the departmental cultures that shape, and are shaped by, these perspectives.

Methods

This section is comprised of four sub-sections that describe the research design, faculty participants, data collection, and data analysis.

Research Design

The current study is an exploration of an engineering program's culture of student engagement through qualitative methodology. This qualitative study takes some methodological elements from the realist ethnography tradition, which "describes and interprets the shared and learned patterns of values, behaviors, beliefs, and language of a culture-sharing group"[22]. The qualitative data were collected using a structured interview[23]. The analysis of the data was focused on identifying patterns of values and beliefs on student academic engagement among the interviewed faculty, and in comparing these patterns with relevant literature[22]. Qualitative methods of data collection and analysis were considered appropriate for this study because the research questions investigate faculty members' perceptions and beliefs on student engagement, and on their own teaching experience. As Kelly and Bowe mention when reflecting on the value of qualitative research in engineering, "if the research questions are about what people think or know or do or how they experience something, then qualitative methods often offer the best solution"[24]. This study received approval by the Institutional Review Board.

Faculty Participants

Nine faculty members (including an academic advisor) from an interdisciplinary department of engineering of a medium size university in the Mid-Atlantic participated in the current study. Three of the participants were female and six were male. The sampling technique used was criterion sampling. This type of sampling was appropriate because criterion sampling enabled for selecting participants which are representative of the culture-sharing group [22] (i.e., faculty and academic advisors from the university engineering department), which was indeed the case.

Data Collection

The data were collected using a structured interview[23]. The interview protocol was developed by the team of researchers in an iterative process that included piloting the interview. The final

protocol has fourteen open-ended questions addressing four main areas of interest: faculty members' conceptions of success and success's relationship with engagement, perceptions of the main characteristics of student academic engagement, strategies for increasing or maintaining student academic engagement, and perceptionsof the distribution of responsibilities in student academic engagement. The definition of student academic engagement utilized in this study was the one proposed by Newmann: "student's psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills or crafts that academic work is intended to promote"[25].

To minimize bias during data collection and analysis, two research team members with psychology backgrounds (and not associated with the engineering department) conducted the interviews, managed the raw data and participants' identifiable information, and oversaw data analysis. Research team members associated with the engineering department did not participate in the interview or data analysis processes, nor did they have access to the raw data.

Data Analysis

Following Creswell's[22] recommendations, data analysis was focused on identifying patterns of values and beliefs on student academic engagement among the interviewed faculty, and in comparing these patterns with relevant literature. The data was analyzed in two phases. During the first phase, the patterns observed in faculty members' responses from the first three sections of the interview (faculty members'conceptionof success and its relationship with engagement, perception of the main characteristics of student academic engagement, and strategies for increasing or maintaining student academic engagement) guided the development of three codebooks (Appendix). Using a double-coding technique[22], these initial codebooks were contrasted with relevant student engagement literature across secondary education domains. The development of the codebooks followed an iterative process in which initial codes were analyzed and combined to form broader themes. The themes utilized in the three codebooks were selected taking into account the frequency of occurrence—which represents the participants' interest in certain topics—and relevance of the topic according to the literature review.

In the second phase, two researchers coded the data from the first three sections of the interview using the codebooks. The researchers then calculated the frequency of codes and the number of participants who mentioned each code. Average frequency of codes and participants' representative quotes are reported in the results and discussion sections. The use of embedded quotes helps to bring participants' voices and to support the relevance of the analyzed themes[22]. The last section of the interview (faculty members' perception of the distribution of responsibilities in student academic engagement) was analyzed observing emergent patterns in faculty's responses and identifying representative quotes.

Results and Discussion

This section is organized by research question. Faculty responses from each section are presented and discussed. Our findings are contrasted with relevant literature.

RQ1: How are engineering faculty members perceiving and defining student success? Specifically, do engineering faculty members consider student success and student engagement to be related and how?

In the first section of the interview, engineering faculty members were asked to reflect on the concept of *student success* and to provide a definition of *student success*across two contexts (in the academic engineering environment and in the professional engineering environment). More specifically, they were asked the following four questions: i) How do you define student success?(Q1), ii) How do you define professional success? (Q2), iii) Comparing the engineering academic environment and the professional engineering environment, do you define success similarly or are there differences? (Q3), and iv) To what extent do you agree or disagree that a successful engineering student is also an engaged student? In other words, are success and engagement related?(Q4). Table 1 presents ten themes that emerged and that were utilized to code the responses to these four questions. The coders' averages of the frequency of themes and the number of participants who mentioned each one are also presented. Responses coded as *Importance of GPA* were further analyzed as low (L), medium (M) or high (H), in order to capture the degree to which participants considered GPA as important, in defining student success. More specifically, a low (L) rating represents GPA not being important to student success, a medium (M) rating represents GPA being moderately important to student success, and a high (H) rating represents GPA being highly important to student success. Likewise, responses coded as *Success and Engagement* were further rated as low (L), medium (M) or high (H), in order to capture the degree to which participants considered *student success* being related and important to *student engagement*.

Table 1. Themes that emerged in faculty responses to describe *student success*and *student engagement*. *Coderaverages for each themeand the average number of faculty who mention each theme are presented.*

	Importance of GPA			**Individually defined**	**Application of knowledge**	**Success and engagement**			**Professional performance**	**Growing / development**	**Wide set of skills**	**Understanding concepts**	**Perseverance**	**Passion**
	L	M	H			L	M	H						
Q1	5.5	2	0	4	3.5	0	0	2	0	2.5	1	3	5	1.5
Q2	0	0	0	3	0	0	0	0	4.5	5	1.5	0	1.5	1
Q3	3	0	0	2	2	0	0	0	3	2	2.5	1	2	0.5
Q4	0	0	0	0	0.5	0	1	8	0	0.5	0	1	0.5	0
Totals	8.5	2	0	9	6	0	1	10	7.5	10	5	5	9	3
No. Faculty	6.5	2	0	4.5	3	0	1	8	6.5	6.5	4	5	5.5	2.5

When reflecting on the concept of *student success*, many faculty members mentioned college GPA as a typical indicator of *student success*. The majority of them, though, reported that GPA has limited value for determining student academic potential. Perseverance and effort were mentioned as morevaluable indicators of success. When asked to define success in the academic and professional environments, the majority of participants considered that in both environments success should mainly be understood as personal growth or development. In other words, success should not be understood as reaching certain position or achieving specific goals, but as a developing process. The following quote from one faculty member summarizes this point: "I

believe it [i.e. success] also includes professional development (is the professional getting smarter? Is s/he developing their expertise?) I guess I am looking for growth." Several participants specifically mentioned that both academic and professional success should be individually defined because they are directly related to personal goals and interests. Also noted was that success in the professional environment should take into account the ability to respond to the requirements of particular professional settings. A successful engineer is not only one who persists and exerts a lot of effort, but one who is "able to bring value and carry out assigned tasks," as one participant said. Finally, when asked whether *student success* and *student engagement* were related, the majority of faculty participants responded that if success is defined in terms of personal growth and not in terms of "high GPA" then engagement is an essential component for success.

Faculty responses indicate that student engagement is considered a crucial component of the student academic experience. Engagement and motivation are seenas key elements of student success, mainly if success is defined as personal growth, as establishing and reaching individual goals. Literature seems to support this view. In a study previously mentioned[15], Hu and McCormick found that students who are labelled as "disengaged" are shown to have significantly lower assessment gains, self-reported gains, GPAs, and persistence rates across all conditions, and are not statistically significantly higher in any metric of academic success used in that study. On the same lines, Coates[17] asserts that it is impossible to assess the quality of any educational experience without assessing student engagement, and proposes that engagement is always accounted for when assessing any university.

RQ2: How are engineering faculty members characterizing an engaged student?

In the next section of the interview participants were asked to reflect on what they considered to be the most common characteristics and specific behaviors of engineering students who are engaged, and of students who are disengaged. Specifically, they were asked the following four questions: i) What characterizes a student who is engaged? (Q6), ii) What characterizes a student who is *dis*engaged? (Q7), iii) What are the *specific behaviors* that characterize a student who is engaged? (Q8), and iv) What kinds of *student behaviors* help you to predict whether a student is going to be a successful *professional* in engineering? (Q9).There were thirteen themes that emerged from this set of questions. These thirteen themes were further classified using three well-known domains of engagement: behavioral, cognitive and emotional engagement[7]. Following Fredricks and colleagues'[7] classification, six emergent themes were categorized within the behavioral engagement domain, four emergent themes within the cognitive engagement domain, and three emergent themes within the emotional engagement domain. Table 2 presents the coders' average frequency for each theme and the average number of faculty participants who mentioned each theme.

Table 2. Themes that emerged in faculty responses to describe *characteristics of engaged and disengaged students*. *Coderaverages for each theme and the average number of faculty who mention each theme are presented.*

	Behavioral engagement						Cognitive engagement				Emotional engagement		
	Class Participation	**Interacting with faculty**	**Interpersonal Skills**	**Leadership**	**Organization Skills**	**Preparation**	**Conscientiousness**	**Perseverance**	**Intellectual Curiosity**	**Ownership of learning process**	**Passionate**	**Self-Motivated**	**Complaining**
Q6	5	4	4	1	0.5	2	3	2	5.5	1	1	7.5	1
Q7*	7	3	1.5	0	0.5	1	0	0	2	3	0	3.5	0
Q8	6	6	2	1	0	2	1	1.5	4.5	2.5	1	2	1
Q9	0	2	6.5	2.5	2	0	0	3	2	3	1	4	0
Totals	18	15	14	4.5	3	5	4	6.5	14	9.5	3	17	2
No. Faculty	9	9	7.5	3.5	3	2	3.5	4	6.5	4.5	2.5	8	1

* Characteristics of disengagement

The majority of the faculty members interviewed identified *class participation, student interaction with faculty*, *self-motivation*, *interpersonal skills*, and *intellectual curiosity* as among the most important characteristics of student engagement in the engineering major. One participant offered a detailed description of several of these aspects:

> "Are students listening and taking notes? Are they actually working through the problems or are they checking their phone? …Are they interacting with classmates in productive ways? Are they asking and answering questions? Also, out of class interactions:[are they] emailing questions rather than waiting to get an assignment back?… Some of the best conversations are not about class work, but about related topics. They are making connections and internalizing learning as part of their life. Their career should be something they enjoy personally, not just for the end goal (i.e., just getting a job or making money). Also they are more likely to get involved in project work out of class".

One of the questions in this section of the interview asked participants to specify which characteristics and behaviors are good predictors of future professional success. Interestingly, the majority of faculty members considered *interpersonal skills* to be an essential predictor of students' future success in the professional arena. Specific skills mentioned included having a collaborative mindset, knowing who to ask for help, knowing how to relate with professional colleagues, and knowing how to accept criticism. Some participants reported that the professional environment requires engineers to be proactive problem-solvers, and being a self-motivated student who can take charge of situations was identified by multiple participants as a predictor of future success.

When asked about characteristics or specific behaviors of disengaged students, participating faculty typically mentioned not participating in class, not interacting with faculty, lacking self-

motivation, and not having intellectual curiosity. For some participants, disengagement was not necessarily related to having low grades or being able to graduate. According to them, disengaged students who are *mainly* focused on their grades or in graduating without taking advantage of the whole learning experience often struggle in many areas. One participant specifically reflected on this issue:

> "[Disengaged students] don't have long term plans, [they are] waiting for you to tell them what to do and when. [There is] no initiative or creativity. Everything is a means to an end: to pass or to graduate. You wonder what will happen to students like these – how will they cope? In a program like ours, they are the ones who consistently struggle with their engineering identity."

This section of the interview provides insightful information on faculty members' perspectives on student engagement. When asked to describe engaged and disengaged students, faculty participants provided a rich representation of students. Engaged students were described as students who actively participate in class, ask relevant questions, come prepared to the class, and generally have a proactive attitude about their learning process. Disengaged students were described as students who do not pay attention in class, who do not take notes, sit in the back, do not take advantage of office hours, and lack curiosity about the material. Responses to these questions reflected faculty's insight on this matter. Participants had a good idea of what an engaged and a disengaged student are. They provided a detailed description of their in-class and out of class behaviors, their attitudes, and their approach to learning. This illustrates, again, the faculty's perceived importance of student engagement in the student academic experience. It was also interesting to see that disengagement was not necessarily related to low grades. Some faculty explicitly mentioned that a student with lower grades, who struggles more with the class material, could even be "more engaged" than an A's student. Perseverance, effort, willingness to not give up, and ownership of their learning process are all characteristics of engagement that could perfectly be present in low-grade students.

Interestingly, the themes that emerged also illustrate the multifaceted aspect of engagement already noted in the literature[7]. Interviewed faculty members commonly believed that engaged students not only participate in class and are open to interactions with faculty, but also have intellectual curiosity and are self-motivated. As Harper and Quaye[26] note, engagement requires more than mere participation. 'Acting' engaged without 'feeling' engaged could just be compliance[14]. Behaviors, feelings and cognitions are all dimensions of the individual that are dynamically interrelated; thus, approaching engagement separating these elements or only taking into account some of them would provide an incomplete perspective of this construct[7].

Finally, when asked about the students' behaviors that work as indicators of future success in the engineering profession, more faculty members mentioned behaviors coded as interpersonal skills and intellectual curiosity than passion and preparation. This also seems to coincide with research. Gorodetskaya and colleagues[27], for instance, found that employers in STEM fields consider personal factors (i.e. interpersonal skills, collaborative learning) more important that other non-personal competences.

RQ3: What are engineering faculty members doing to establish, maintain, or increase student engagement?

In the next section of the interview participants listed the strategies that they used for increasing or maintaining student academic engagement (Q11). They also listed the strategies that they considered could be implemented by the faculty for increasing or maintaining student academic engagement (Q14). Table 3 presents the nine themes utilized to code the responses to these questions and the coders' averages of the frequency of themesand the number of participants who mentioned each one.

Table 3. Themes that emerged in faculty responses to describe *strategies for increasing student engagement. Coderaverages for each theme and the average number of faculty who mention each theme are presented.*

	Classroom Innovation	**Encouraging Student Autonomy**	**High Standards**	**Being accessible**	**Emphasizing application of knowledge**	**Project opportunities**	**Building anengineering culture**	**Incentives for Faculty Engagement**	**Interclass communication**
Q11	3	4	1	1.5	3	1	1	0	0
Q14	1	1	0	0	1.5	1	3	2	4
Total	4	5	1	1.5	4.5	2	4	2	4
No. Faculty	3.5	5	1	1.5	4	1	4	2	4

When asked about the specific strategies that they use to promote student engagement, faculty members mainly mentioned that they tried to encourage student autonomy and independence: "I place more responsibility on the student now than I used to by taking a direct approach with students and putting the responsibility on them. What is your responsibility and your role in all this?" Faculty reported that by encouraging students to be proactive and independent they were helping to shape an engineer identityand, thus, fostering engagement in engineering. Other strategies mentioned were related to having a less traditional format of teaching by using active learning techniques, problem-solving activities, promoting discussion in class, etc., or making stronger connections between the class material and the real-world applications.

Finally, when asked to list strategies that could be implemented to increase student academic engagement, faculty members mentioned strategies focused on connecting students with their peers, including developing peer-mentoring programs, organizing more social events, and connecting upperclassmen with freshmen through tutoring programs. Another reported strategy for promoting student engagement is to reinforce it by recognizing professors who do a good job of engaging students or formally recognizing students who are academically engaged. Providing incentive (i.e., funding) to faculty members or students who want to be involved in research was also considered a good way to promote engagement.

In reflecting on faculty participants' responses to strategies used to increase student engagement, it was interesting to observe that the faculty members did not provide a wide variety of strategies. Moreover, as observed in Table 3, some of these strategies are utilized by only one or two participants. This might be indicating that, although the interviewed faculty members do

seem to care about student engagement, when it comes to strategies to increase engagement, there seemed to be a lack of specific knowledge and methods. It is also interesting that the predominant strategy that engineering faculty members use to increase student engagement is *encouraging student autonomy*. Further, when asked what specific endeavors could take place to increase engagement, the predominant answer was to increase *interclass communication*, or the mentoring relationships between upper- and lowerclassmen. This shows that engineering faculty members place a high degree of responsibility on the students to create their own opportunities to engage and have a culture that facilitates engagement with the faculty acting as nurturers and cultivators.

In terms of strategizing to increase engagement, it is important to note the differences that previous literature highlight among STEM fields and non-STEM fields. For example, Neumann and Neumann[28] studied the core work values preferred by engineering majors compared to other majors. Engineering majors placed significantly higher value on separate and mutually exclusive values such as independence and prestige, while their liberal arts counterparts preferred inclusive values such as aesthetics and altruism. It is important to recognize such differences when taking the results of the present study into account. Since our sample (which were entirely engineering faculty) gave results that corroborates the notion of STEM culture shown by Neumann and Neumann as being highly independent and intellectually curious, a conclusion can be drawn that the field of engineering might be distinct in its emphasis on mainly fostering student autonomy.

RQ4: How do engineering faculty members perceive their role and the department's role in promoting and maintaining student engagement in comparison to the role students have?

At the end of the interview, faculty members were asked to reflect on the distribution of responsibility among faculty and the department when it comes to promoting and maintaining student academic engagement. Specifically they were asked the following questions: i) Do you think the faculty have the responsibility to increase or maintain student engagement in engineering? (Q10), and ii) Do you think there should be an organized departmental effort to promote student engagement? (Q12).

When asked whether faculty members had a responsibility in student engagement, five out of nine participants responded that faculty had a *moderate* responsibility, meaning that although the faculty play an essential role in student engagement, students also needed to take responsibility in their own learning process. One participant's response illustrates this position:

> "[It is] not completely the faculty's responsibility, but there are not often entering students who are already excited to learn. … Students' ways of learning have evolved, so we must progress as well, but we have to meet in the middle. They must also learn to be independent. We can give them the tools, but they must make it on their own".

Two out of nine participants emphasized more of a faculty responsibility towards student engagement. This is not to say that the faculty members placed all responsibility on themselves, but that they thought that student engagement was only possible if the faculty was actively

working to engage their students. The following quote from one participant illustrates this position:

> "If you are not open to interactions of all types with students you will threaten their engagement. I spend time mentoring students who are engaged in some ways but not others. …This is not a requirement for faculty, but it is very important to promoting student success. Most of the time students look for a way to apply concepts learned in class, and interactions with faculty can provide this opportunity. I think the faculty should do more, but it's not going to happen unless there are some incentives in place."

Finally, two out of nine faculty participants believed that faculty have a limited (or none) responsibility to promote student engagement. They thought that the faculty role was to be good professors and to provide students the information that they needed, but not to "engage" them, as it is explained by this professor: "…Our job is to promote good learning and be good teachers, but ultimately students are the ones who must take responsibility for their own learning and passion. It is up to us to provide a good example, but they must do the work." The same professor also added that disengagement may be an indicator that a student does not belong: "We shouldn't have to engage everyone; some who are not engaged probably should leave the program."

During the interviews, researchers also asked participants to reflect on the engineering department role in student engagement, and whether there should be a departmental effort to promote student engagement. The majority of faculty members were hesitant about what exactly the department role in student engagement should be. They tended to think that an organized departmental effort to promote student engagement could result in positive outcomes if there was a well-organized, inclusive approach. Some professors mentioned, for instance, that it is important to define first who should be "engaged", and to question whether the department goal should be to engage everyone: "…some students still really aren't prepared. …We need quality not quantity. Are we using all this effort on people who don't really benefit from it? Not everyone needs to be an engineer." Others focused more on the specific strategies for promoting student engagement, and mentioned that some strategies could actually be potentially detrimental:

> "If that [departmental] effort means to promote opportunities for engagement, then yes. But you cannot force engagement. …it could turn out to be even worst: if a student who does not want to participate in an independent study is 'forced'in a way to be there, then s/he could affect negatively the team work."

As illustrated in the previous response, some professors thought that adequate strategies for promoting engagement should be focused on providing *opportunities* for engagement and not on directly trying to engage students with "engaging activities."

Given that this study explores the culture of student engagement in one specific engineering department, researchers also believed that it was important to ask participants to reflect on the departmental culture of their institution. Specifically, faculty members were asked the following question: Do you think there is a defined culture in this engineering department? If so, what

values are represented within that culture? (Q13). Five out of five participants who answered this question said that the engineering department did not have yet a clear institutional culture. Some mentioned that they were "working toward it". Interestingly, one mentioned that such a culture should emphasize student engagement.

The variety of responses to the question regarding faculty responsibility in student engagement seems to support faculty claims about the lack of a clear departmental culture. Some faculty stated that student engagement is simply not possible without faculty intervention. According to these participants, faculty members are not neutral in terms of student engagement. Faculty has a responsibility that goes well beyond transmitting accurate information and using adequate teaching methodologies; their duties also include being accessible and open to all types of interactions with students. Other faculty members' responses emphasize their role as "facilitators" of student engagement. Their job is to provide "opportunities" for engagement, to construct the appropriate environment that makes engagement possible, but not to actively engage students. The weight of the responsibility of student engagement is mainly on the students and the faculty role is being on the side facilitating this process. Finally, a third group of faculty members reported that faculty hasnone or almost no responsibility for student engagement. Their responsibility within the students' learning process is to "promote good learning and be good teachers," but not to actively engage or motivate students. Students should come motivated and not expect to be motivated by their institution. For some participants, student disengagement was considered not a cause of concern but an indication that the student might not belong inengineering. Some faculty members were even concerned with potential negative implications of actively trying to engage students, such as the possibility that many disengaged students probably do not want to be engineers, and should not be "forced" to be engineers.

This wide variety of perspectives about faculty role in student engagement illustrates the still emerging nature of a student engagement culture at the engineering department being studied. This is further illustrated by faculty members' responses to the question regarding whether there should be a departmental effort to promote student engagement. Faculty members were hesitant to provide a definite answer to that question. Participants were unsure on what to expect from such a departmental effort. Would it be focused on providing "opportunities" of engagement (such as more independent study opportunities), or on actively trying to motivate students? Some participants mentioned that because of differing teaching ideologies and perspectives on engagement they did not think that a truly unified departmental effort was an actual possibility.

We are primarily attempting to discover how faculty members perceive their role in student engagement, but it is also important to understand how faculty perceptions interact with student perceptions. Recalling Pan and Gauvain[16], it has been shown that students who perceive institutional support as essential to academic success tend to begin secondary education with higher autonomous motivation, but decrease in motivation much more quickly than students who place importance elsewhere. Taking this into account, interpreting the results of the present study requires an understanding of the disconnection between faculty and student perceptions of responsibility in engagement. In this context, it may be the case that certain faculty attitudes and strategies may either help or hinder student engagement in accordance with the students' attitudes. Faculty members who are more proactive in these processes might help students who

place more importance in institutional support, but might deter other students who are seeking more independent routes through which to engage. Alternatively, faculty members who believe their job is to foster and provide opportunities to engage may provide such opportunities for independent students, but may overlook students who could have become increasingly engaged and successful.

Implications, Conclusions, and Future Research

Although there are many studies on student engagement, including engineering student engagement, studies focused on the culture engineering programs have in regards to student engagement are limited. This is partly due to the fact that it is not trivial to measure departmental culture, let alone the department culture in regards to student engagement. In this current study, we interviewed nine of a total of fourteen engineering faculty from one engineering department to gain insight into how faculty perceive student success, student engagement, and ultimately the role faculty plays in maintaining and enhancing student engagement. The impact of having a cohesive and explicitly defined culture of student engagement means that there would likely be (a) clear messaging to students and the roles that faculty and students play in being engaged citizens of the undergraduate engineering experience, (b) an increase in faculty cohesion and teaching effectiveness, as well as (c) students understanding their own responsibilities. Having a strong and cohesive culture of student engagement is likely to also lead to increased recruitment and retention rates for a more diverse undergraduate student body.

In this study, we learned that although there was consensus about what it means to be a successful and engaged student (and even how such characteristics translate to the professional settings) among the faculty participants, there was not a consensus about the role that faculty plays in maintaining and enhancing student engagement. This was illustrated in faculty responses pertinent to strategies they use and explicitly in their responses to the role and responsibility they as faculty hold. Three profiles of faculty were identified: (1) *High Engagers* – those who believed that faculty played a key and critical role in establishing a culture of engagement, (2) *Moderate Engagers* – those who believed that the responsibility was shared by both the faculty and the students, and (3) *Low Engagers* – those who believed that faculty have little (or none) responsibility to actively engage students, who should come into the program already motivated and engaged. Although the majority of faculty participants in this study would be classified as *Moderate Engagers*, it was revealing to see that there were also *High Engagers* and *Low Engagers* in the department. Where do other engineering faculty stand across engineering programs nationwide? Are there differences across engineering disciplines? Are there differences among different faculty demographics? Do engineering programs have clear and cohesive cultures of student engagement? These are questions that we believe to be relevant to the engineering education community because the implications are immense. Clearly stated and implemented departmental values, beliefs, and behaviors relevant to student engagement may represent an important step toward maintaining students' motivation and desire to learn (and hopefully retention). As future research directions, we hope that the current qualitative-grounded study will enable us to develop an instrument to measure the culture of departments in regards to student engagement.

Limitations

Given that this is an exploratory study of a specific engineering department's culture of student engagement, the results obtained here are not generalizable. We hope they represent a useful case study that contributes to an understanding of engineering faculty's perspectives on student engagement, but no inferences should be made about other institutions. Future research testing specific hypotheses about faculty members' perspectives on student engagement should consider increasing the sample size and utilizing quantitative research methodology. Another limitation of this study is the presence of research team members associated to the department of engineering. Although steps were taken to avoid bias in data collection and analysis processes, it is likely that the presence of colleagues involved in the research may have affected the way faculty members responded to the questions.

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Appendix A

Codebook 1. Defining success. *Definitions and sample quotes.*

Codes	Definition	Sample quotes
Importance of GPA*	Subject mentions grades or GPA	"a decent GPA" "high marks"
Application of knowledge	Subject mentions utilizing knowledge gained in academic settings for useful purposes, being able to deal with real-life problems.	"apply what you have learned in a classroom environment outside of a classroom"
Growing / development	Subject mentions growing in a general sense: career advancement or personal growth.	"is the professional getting smarter? Is s/he developing their expertise? I guess I am looking for growth."
Professional performance	Subject mentions doing high quality work in a professional setting.	"focus on productivity"
Wide set of skills	Subject mentions having a set of valuable skills, such as interpersonal skills (recognizing one's personal responsibilities in the interpersonal context of an organization).	"do you understand the environment you are in, the goals of the company, and how you fit in?"
Individually defined	Subject mentions that success should be individually defined, according to each person's beliefs, and goals	"set personal goals and achieve them, this is my standard but not everyone's, success is defined individually"
Success and engagement*	Subject mentions that success and engagement are related	"if you are personally engaged this may well lead you to success"
Passionate	Subject mentions feeling passionate about the material.	"It seems that if you are passionate about your work, the definition of success changes. It comes back to, what are your goals?"
Perseverance	Subject mentions using one's best effort and persevering through failure, valuing the learning process.	"Success is applying yourself, putting your best toward your studies. putting your best foot forward and working hard"
Understanding concepts	Subject mentions understanding concepts or the course material as something key for success.	"understanding the concepts you've been taught in class"

* L: not or not too important, M: moderately important, H: very important.

** L: not or not too related, M: moderately related, H: strongly related.

Codebook 2. Characteristics of engagement and disengagement. *Definitions and sample quotes.*

	Codes	Definition	Sample quotes
Behavioral	***Class participation***	Subject mentions engaging / not engaging in a classroom setting (i.e., communicating with teachers or peers, paying attention, sitting in the front, and taking notes).	"if they are paying attention, if they are doing their work, if they ask questions, if they do their homework"
	Interacting with Faculty	Subject mentions actively seeking / not seeking faculty for help and discussion, whether in a classroom, in office hours, or in other settings.	"come talk to me frequently – even without a specific need sometimes"
	Interpersonal Skills	Subject mentions having / not having the ability and desire to create and maintain healthy communicative relationships with peers and the community.	"students who are outgoing, not afraid to talk to people, especially people they don't know"
	Leadership	Subject mentions possessing / not possessing the qualities of a leader.	"fill leadership roles in team situations"
	Organizational Skills	Subject mentions being / not being systematic, organized, having planning skills.	"well-organized"; "turning work in late"
	Preparation	Subject mentions being / not being prepared for all obligations, such as reading ahead of class, studying, etc.	"coming to class prepared"
Cognitive	***Conscientiousness***	Subject mentions being / not being responsible, thoughtful, careful.	"being generally conscientious"
	Perseverance	Subject mentions using / not using one's best effort and persevering through failure, valuing the learning process.	"Repeating labs if necessary (staying extra hours)"; "those students may not have best test scores, but the try the hardest"
	Intellectual Curiosity	Subject mentions having / not having a desire to increase knowledge in the material, making connections between different courses or topics, and possessing intellectual creativity.	"ask themselves: what kind of problems can I solve with this knowledge?"; "Discussing engineering or course material with their peers"
	Ownership of learning process	Subject mentions taking / not taking ownership of learning process. Not feeling / feeling entitled.	"looking to be fed information rather than take responsibility"; "placing blame on others"

Emotional	***Passionate***	Subject mentions feeling / not feeling passionate about the material.	"show a genuine interest in the topic"
	Self-motivated	Subject mentions being / not being self-motivated, taking initiative, volunteering.	"finding out what your strengths and weaknesses are and working with them, taking steps to help yourself"
	Complaining	Subject mentions openly dissenting or having a negative attitude about academically related topics.	"not just complaining all the time"

Codebook 3. Engagement strategies. *Definitions and sample quotes*

Codes	Definition	Sample quotes
Classroom innovation	Subject mentions using innovating classroom procedures.	"using active learning techniques. group work in class"
Encouraging student autonomy	Subject mentions explicitly placing the burden of initiative and responsibility to seek knowledge and engagement on the students.	"putting the responsibility on them. what is your responsibility and your role in all this?"
High Standards	Subject mentions maintaining high standards.	"If you set the bar at average, the likelihood of getting average is 50%. If you set the bar high, and you drop 50% you are still above average. That is what I tell students: if you don't like the bar set high, you still need to do what you need to do to succeed."
Being accessible	Subject mentions maintaining a close relationship with their students, being approachable, being a mentor.	"being open to interacting with students in varied and sometimes non-traditional ways. Focus on mentoring"
Emphasizing application of knowledge	Subject mentions explaining the real-world applicability of the topics learned in class.	"mirroring real-world activities in class."
Project opportunities	Subject mentions providing opportunities for engagement, such as research projects.	"I provide opportunities for engagement by trying to offer interesting, rigorous and applicable capstone and independent projects."
Building anengineering culture	Subject mentions that it is important for engagement to build a clear JMUEngineering culture	"get a culture going among the faculty – this is what we value."

Incentives for faculty engagement	Subject mentions promoting engagement through incentives to faculty, such as recognizing faculty work promoting student engagement, or having funding available for research.	"some form of incentives and recognition for the time faculty spend"
Interclass communication	Subject mentions the relationship and communication between the different levels of students (freshman-senior), through peer-mentorship programs, for instance.	"having upperclassmen be a part of the first year experience"; "having a stronger student mentorship program"