BOARD # 317: A Qualitative Study of Undergraduate Engineering Students' Feelings of Being Overwhelmed

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CAREER: A Mixed-Method Study on Undergraduate Engineering Student Wellbeing

Introduction

The feeling of being overwhelmed is more common than one might expect. A recent study suggests 72% of adults have reported experiencing a psychological symptom of stress, including feeling overwhelmed, changes in sleep, and constant worry [1]. Despite stress and overwhelm often being linked or felt simultaneously, the connection between the two emotions is understudied. Overwhelm can be distinguished as the experience that follows when a person has experienced a debilitating amount of stress. Although the person is not necessarily stressed at that moment, they carry an emotion from the thought of the stress or experience they have had. A study by psychologist Clifford Hurvich, determined descriptors of overwhelm to be feelings and forebodings of being smothered, engulfed, flooded, fragmented, entrapped, being unreal, unable to cope, or disappearing [2, p. 618]. Experts are in consensus that mental health, especially in the United States, has been on a decline amongst young adults [3]. Alarming rates of young adults with developing or worsening mental health disorders have become especially prominent in undergraduate students [4]. As a result, our team has sought to explore the feelings of stress and overwhelm for undergraduate students in engineering programs.

Previous literature has shown that engineering stress culture is a common phenomenon that many students are aware of but may not know how to verbalize or conceptualize [5]. The culture of engineering has been described as one of high stress, heavy workload, and burnout as a method of achieving one's goals. Engineering programs are considered rigorous and require hard work, which may include sacrifices for mental health and well-being. Students in engineering may struggle to understand or conceptualize their feelings of stress, overwhelm, burnout, and anxiety due to a limited range of vocabulary for self-expression. Furthermore, the engineering stress culture has become so normalized that students may not even recognize that these are feelings of concern due to this culture being such a common shared experience amongst engineering students. In the most recent year of our team’s longitudinal study on engineering stress culture, we sought to further the investigation on overwhelm and stress through self-reported measures.

Methods

Our overall project is a series of mixed methods studies, including a longitudinal survey designed to investigate a culture of high stress in undergraduate engineering education [6]; in this paper, we focus on the role of overwhelm and burnout and preliminary results from predictive analyses of stressors and culture on student wellbeing and persistence. We used a series of advertisements including emails and flyers to recruit participants. Over the course of five

semesters, a survey was administered twice per semester to undergraduate engineering students, establishing a total of ten time points. The survey captured 3,591 responses over the five semester time span, with a total of 588 participants.

The development of the survey has been previously described [6]. The survey sought to examine the perceptions of engineering stress culture and its influence on intention to remain in the engineering program (refer to Figure 1 for a description of survey components). Refer to Figure 3 for a summary of engineering stress culture factors and stressors [6]. There were additional quantifiable questions including questions in the last two time points that assessed the frequency of occurrences for engineering experiences. These quantifiable questions were formed from qualitative, open response questions from time point 7 (Figure 2). From the time point 7 open response questions, we were able to identify common experiences of participants when feeling overwhelmed. These experiences were formed into two groups, one that focused on physical experiences and symptoms of feeling overwhelmed, while the other focused on emotions and states of being when feeling overwhelmed. Each time point also included one to five open response questions for qualitative analysis. Demographic questions in the survey consisted of first generation status, gender identity, financial status, and more. All questions were asked in first person to encourage students to reflect on their personal experiences.

Item Category	Number of Items
Engineering Stress Culture Scale	10
Undergraduate Stressors	48
DASS-21 Stress Subscale	7
Adapted Subscale of Intention to Remain in Engineering	6
Total	71

Figure 1. *Description of Survey Components*

Category	Question
Overwhelm	In general, how often do you feel overwhelmed?
Overwhelm	How much have your experiences of feeling overwhelmed impacted your ability to do your work, take care of things at home, or get along with other people?

Figure 2. *Description of Additional Questions for Timepoint 7*

Factor	Description
1	How well do you feel your program creates a welcoming environment to all identities
2	How much does your program give importance to mental health
3	Participant's perspective on engineering students' work/life balance
4	Participant's perspective on engineering programs success culture
5	Participant's perception of their engineering identity compared to others
6	Participant's perception of engineering student rigor compared to others
7	Participant's perspective on their program's preparation for success in the job market
8	Participant's concern for their future after their undergraduate career
9	Participant's perspective of professors' contributions to creating a welcoming environment

Figure 3. *Description of Engineering Stress Culture Scale Factors*

Analyses

Quantitative data analyses were conducted in R, through the use of descriptive statistics as a means to identify possible relationships amongst variables and guide linear and logistic regression models. Linear regression models were used to examine the predictive relationships of variables to engineering undergraduate stress and changes to these relationships over time. Logistic regression models were used to comprehend the impact of aspects of engineering stress culture on student intention to remain in engineering. Thematic analysis was used to understand student conceptualization of feeling overwhelmed. There were 418 open responses that were analyzed for time point 7. From those responses, a total of 40 codes were generated. The 40 codes were then grouped into eight overarching themes based on definitions of the codes and subcodes.

Results

In this section, we present a high-level summary of our team's analyses during the latest reporting year. Preliminary linear regressions indicated that Factors 1, 2, 3, 6, and 8 (refer to Figure 3) were found to hold the strongest predictive power in combination for predicting a student's overall stress levels. Preliminary logistic regressions indicated that Factor 7 and Factor 1 (refer to Figure 3) were the strongest predictors in combination for a students' intention to remain. The two factors are negatively correlated with intention to remain.

There were eight themes that resulted from grouping the codes and subcodes from qualitative analyses. The eight themes were Workload, Internal Reactions, Burnout, Physical Reactions, External Reactions, Brain Processes, Approach, and Time. These themes were created from

codes and subcodes that shared similarities, whether that be in perception of overwhelm, physical and emotional experiences surrounding overwhelm, or approaches to and causes of feeling overwhelmed.

Analysis of qualitative coding in time point 7 (n = 418) indicated that conceptualizing overwhelm was possible for the majority of students. Most students were able to identify reactions they associated with being overwhelmed. However, other students struggled to describe the feeling of overwhelm due to them believing they were in a constant state of overwhelm, so it felt no different from their current state. Students attributed feeling overwhelmed to feelings of stress, anxiety, and physical reactions with negative impacts on their mental or physical wellbeing. The negative connotation associated with feeling overwhelmed seemed to stem from student perceptions of time, workload, and methods of dealing with stress. Approaches to managing stress (e.g., making a list, taking a break) were inconsistently described as effective, with methods sometimes feeling beneficial, while others felt the methods caused more feelings of overwhelm.

Discussion

Factors associated with mental health, wellbeing, environment, and career had the strongest predictive power on determining a student's stress levels. Factors regarding engineering identity and preparedness for the future job market were found to have the strongest predictive power for a student's intention to remain in their engineering program. Consequently, undergraduate student stress and intention to remain are influenced by many factors, with students of marginalized identities experiencing increased stress levels and decreased intention to remain in their engineering programs compared to students of non-marginalized identities.

The connection between stress and overwhelm is understudied. Thematic analysis indicated that undergraduate students were found to have intense reactions from feeling overwhelmed and a difficult time managing being overwhelmed. Qualitative coding revealed that undergraduate students often reported feeling stressed and overwhelmed synonymously, even reporting stress as a symptom of their feeling overwhelmed. Despite this, linear and logistic regressions showed that feeling overwhelmed had less predictive power over a student's stress and intention to remain in their program. Thus indicating that the relationship between overwhelm and stress requires further studying to better understand the correlation between the two emotions.

Sharing and expanding upon these understandings of overwhelm with educators provides a greater understanding of undergraduate students' experiences surrounding feeling overwhelmed. This may promote educators changing course structure to promote a more inclusive and supportive environment. Further discussion around overwhelm and engineering stress culture

needs to happen to better equip undergraduate engineering students with the understanding, approaches, and support necessary to improve their engineering experience.

Future Work

During the last year, we have also analyzed bivariate and multivariate comparisons in stress levels and stressor occurrence based on sociocultural identities. A future manuscript by our team will describe relationships between engineering stress culture and identity. Further exploration with the data includes expansion on qualitative analysis for each time point.

Acknowledgments

This material is based upon work supported by the National Science Foundation under Grant No. 1943541. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation. The authors also thank the students who participated in the survey.

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