

Transitions in Engineering: How Students Prioritize Themselves Through Challenge and Change

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Introduction

This empirical research study investigates how engineering students learn to prioritize their physical and mental well-being as they navigate their undergraduate degrees.

Engineering students face distinct stressors compared to non-engineering students, including rigorous academic demands, highly competitive environments, and a sense of social isolation that may increase for students with historically underrepresented identities in engineering spaces [1], [2]. While resilience and coping skills have been studied in general student populations, less is known about how engineering students, including those with historically underrepresented identities, face these stressors and the resources they use to overcome them. Within engineering education research, current research into student well-being has focused primarily on the outcomes (retention, persistence, etc.), rather than the processes and experiences they have as they navigate stressful experiences.

Understanding engineering student experiences is critical because students' mental health and identity have been shown to be closely tied to academic performance, and mental health challenges can exacerbate the pressures of entering an academically demanding engineering environment [3]. Further, sharing these stories can help to normalize the discussion of mental health, potentially counteracting the culture of stress that currently exists in engineering [4]. Therefore, through this study, we aim to answer the following research question: How do undergraduate engineering students learn to prioritize their mental and physical well-being as they navigate stressful experiences throughout their education?

Through answering this research question, we want to understand common challenges students face as they transition through the college engineering environment and how these experiences help them develop positive mindsets around mental health and well-being. These experiences will result in the development of targeted interventions and mental health campaigns to help shift the culture around mental health in engineering.

Theoretical Framework

This study was grounded in Schlossberg's Transition Theory, where a transition is defined as an event that creates a disruption of roles, routines, and relationships for the individual [5]. Schlossberg's Transition Theory, developed in 1981, provides a framework for understanding individuals in transition and how they connect to the resources required to cope with both everyday and unexpected experiences in life [6]. The model has since been applied in engineering education to understand the transition from high school to university level, and how learning is experienced in a new environment [7], [8].

Schlossberg's Transition Theory defines four constructs that characterize a transition: (1) Situation: the catalyst that leads to the transition, (2) Self: the characteristics, background, and values of the individual during the transition, (3) Support: the community that impacted the transition, and (4) Strategies: how one learned to manage their experience through transition [9]. Together, these constructs create a comprehensive framework for understanding the interactions of personal characteristics, environmental context, and coping processes around transitions (See Figure 1).

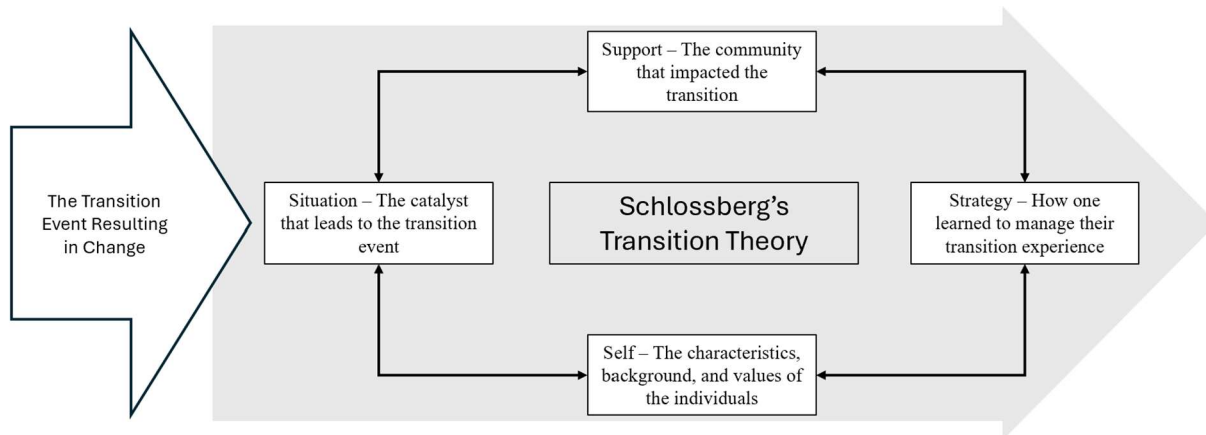


Figure 1: Connections between the constructs of Schlossberg's Transition Theory [9].

Methods

Data Collection

Research for this project was conducted in a college of engineering at a primarily White, large public university in the United States. Students were recruited through the university's engineering listserv and those interested in participating were asked to complete a pre-screening survey, which asked participants to provide demographic information and to describe a moment during their college career when they realized the importance of prioritizing their well-being. Students were then selected for participation based on their experience, ensuring that we recruited a diversity of participant identities and experiences. All interviewees were provided with a \$25 Amazon gift card.

Using Schlossberg's Transition theory, a 60-minute semi-narrative interview was developed. For instance, to understand "Situation", we asked questions such as, "From the pre-screening survey, you discussed [summary of event]. Can you briefly describe and share more about that experience with us?" Semi-structured interviews were conducted to allow participants to feel comfortable and take the time to reflect on their personal challenges, sources of support, and persistence strategies, while allowing for the richness and nuance that more structured interviews may lack [10]. Interviews were conducted remotely via Zoom and transcribed using Zoom's auto-captioning technology.

Narrative Smoothing and Data Analysis

Transcripts from the interviews were cleaned through listening to the audio recordings. Narrative smoothing was then used to convert raw transcripts into a smooth and cohesive narrative, as interviewees often do not speak linearly when sharing their story [11]. We planned to use smoothed narratives to support efforts to have the campus mental health adopt portions of the narrative in their on-campus student mental health engagement efforts. We also took steps to preserve the transcripts at each step of the smoothing process to preserve the raw data as needed. As there is no common consensus on how to reliably smooth transcripts [12], we smoothed the transcripts with the goal of keeping sentences intact and removing filler words and repeated ideas to maintain the voice of the participant.

With our theoretical framework in mind, inductive reflexive thematic analysis was conducted on the smoothed transcripts, allowing for a more nuanced approach to the coding while mitigating

the biases when approaching the dataset [13], [14]. Separate codebooks were developed for each S in Schlossberg's Transition Theory. Each transcript was coded at least four times, focusing on one construct at a time, with an analytic memo conducted after each coding pass [15]. The memos for this section included discussions and comparisons of the coding process, challenges that arose in coding, the justification of certain codes to improve workflow, and the emergence of any preliminary themes.

Participants

While 13 total interviews were conducted, four interviews were chosen to be presented for this research brief (Table 1). These interviewees were chosen due to the common themes presented in the coding process of all interview transcripts.

Table 1: Demographic Information on Presented Study Participants

Pseudonym	Gender Identity	Major	Student Type	Years in University
Riley	Woman	Mechanical	In-State	6
Charlie	Woman	Aerospace	International	3
Avery	Woman	Chemical	In-State	3
Parker	Man	Mechanical	In-State	2

Results

Findings from the four participants were synthesized into underlying themes and organized according to the four constructs of Schlossberg's Transition Theory.

Situation

Across the four transcripts, participants described taking on more responsibility than they could manage, which contributed to difficulty maintaining balance, with Riley stating:

"In junior year I tried out and made the dance team... I had also rushed with Greek life my freshman year and did all four years of that and held positions on our exec board, all while trying to balance school, classes, the engineering things, my job, trying to find time for myself and socializing with friends and my sister."

For Riley, attempting to juggle these responsibilities led to a lack of balance between their athletic, social, and academic lives. This resulted in negative self-talk and almost resulted in Riley changing their college major:

"Running on no sleep while trying to do dance and function for classes was hard. It was a gradual buildup of, at first, thinking, "I can do this." As the months went on, I could see a physical and mental difference and a difference in my grades. I started to get sick more often. At that point I was thinking about changing my major because I thought it was too much, maybe I'm not smart enough, and engineering isn't what I thought it was."

Parker also reflected on the impact of juggling academics, work, and their social life, noting that:

"I was stretching myself too thin and I had way too much going on. I'd be gone from 6 a.m. to 2 a.m. the next day. The time management skills I had at the time were not equipped for the amount I had to do. I would put things off until I was out of the house for work and then get everything done that day, it took a huge toll on my mental health."

Other participants described similar experiences, stating that the combined demands of work, social commitments, and academic expectations were the catalysts that resulted in them recognizing the need to prioritize their well-being.

Self

The four participants recognized that a large part of transitioning into a healthier mindset was shifting how they viewed mental health, as well as how they defined the most important aspects of their identity. Parker, having served in the Air Force before joining the university, shared that:

“The Air Force preaches being tough, gritty, and not letting anything get you. When things were getting to me, that was the reason that I felt like I wasn't doing enough, because I was told repeatedly, ‘If you're stressed out, you're wrong, just keep going.’... Now that I'm getting these [mental health] resources, it is a switch from that military mentality over to a mentality of, ‘Being stressed all the time isn't how you should be living.’”

This mindset shift changed how Parker approached their mental health, choosing to seek resources rather than working through their mental health alone. Their mindset changed due to discussions within class regarding mental health resources.

Other participants initially viewed their success and well-being in relation to their academic aptitude and performance. For example, Charlie reported their initial mindset as:

“I associate performance with identity and tell myself who I am based on how I perform. It's that thought of ‘I'm here. I need to be one of the best.’”

After Charlie received a bad test grade, they realized their mindset was unsustainable. When asked about how their mindset changed after their experience, Charlie stated that:

“I thought that my well-being should depend on my performance and I would let go of my well-being to make sure I had a good performance. I now know well-being not only comes from a good performance, but it also comes from taking care of yourself. Now, I take care of myself first and go after what I need to go after so I can conquer what I want to.”

Participants shifted their perspectives by reflecting on different aspects of their identity, including their identity within academic spaces, and recognized how those aspects affected their own outlook, fostering a healthier mindset.

Support

Participants reported both positive and negative interactions with their community (peers, faculty, family, etc.) through their transitions. Participants with a strong peer connection talked about how this supported a more positive mindset. However, those participants who had fewer peer relationships recognized that this negatively impacted their experience, or how the mindsets of their peers impacted their ability to prioritize growth.

Participants reported that some peer interactions had a positive impact on their experience of engineering culture, even before their mindset shifts, from actively engaging with the engineering community through clubs, sororities, and classmates. Avery shared that:

“Joining the engineering sorority has helped with [a social life] because it gives me a community of like-minded women who have experienced the same things. We're all busy. Being able to have people interact in your schedule, it helps maintain that interaction.”

This also showed up in informal peer interactions, like talking with peers after exams or debriefing with roommates. Avery discussed peer support more broadly, saying:

“My roommates were my biggest supporters. We're very like-minded in the way that we approach personal growth, even though we're in different majors.”

However, negative peer interactions were also present for most of our participants. This includes difficulty in finding a community within engineering or hearing negative mindsets from peers that led to negative self-talk or general stress. Charlie found difficulty finding community due to being an international student, reporting:

“At first when you come here as an international student, it's not easy. You start a class, and you see people asking which high school you went to, and nobody went to my high school, so it's already harder for you to be let in because of background differences.”

Other participants agree with this point, mentioning difficulty with solidifying a friend group within engineering compared to the peers they met outside of engineering. Even if community was found, some students reported a lack of a positive environment, with Avery stating:

“Being around a group of people who would promote an environment that is anxious and stressful is very disheartening, and it impacted my way of going about personal health.”

Interviewees reported that the stress and rigor expected of engineering affected how they approached academic expectations and mental health, sidelining self-care for grades. This included increased stress from poor peer interactions.

Strategy

Students across these four interviews described lessening their focus on grades and, instead, placing emphasis on the learning process. This was briefly mentioned in the “Self” section of the results when Charlie discussed how their mindset shifted from prioritizing solely their performance to more broadly prioritizing their well-being. This is part of a larger strategy, in which participants remove themselves from a performance-based approach and lean towards a mastery-approach, where they prioritize the learning process over the grade. Charlie further reported that:

“I could start shifting my perspective on my identity to other things. Do I seek help? Yes, that shows effort. Do I pay attention to class? Yes, that shows that I'm trying. Do I ask questions? Overall, I focus on my effort instead of the results.”

Participants also reported reflecting on their experiences and their place in their engineering journey, re-evaluating how they judge themselves compared to others. This included their grades, learning progress, and personal successes. Riley shared,

“I see freshmen and I feel like I'm stuck, but I realize I have accomplishments, I have to celebrate what I have done, whether it's big or small, and that I'm a lot further than when I started, and that is something to be proud of. Engineering isn't easy, that's something that I must remind myself of every day. Be proud of what you've done, even though you're not where you want or expected to be.”

All interviewees found a balance between their mental well-being and academics by shifting their mindset, including lowering dependence on high grades or reflecting on their achievements.

Discussion and Implications

Through this paper, we present findings from four interviews with students who recognized the importance of prioritizing their own well-being. Students identified taking on too many responsibilities, both inside and outside of academics, as critical catalysts affecting their work-life balance. Work-life balance has been negatively related to student anxiety and stress in prior literature, where finding balance between academic and personal responsibilities was found to improve students' college experiences [16]. This supports the situations that our interviewees reported, where a sense of responsibility and burden shifted their work-life balance and their mental health. Targeted interventions around self-regulatory methods, like teaching students long-term goal-setting strategies and scheduling, have shown long-term positive effects in grades and overall time management behavior [17].

Our participants noted positive peer support as essential in helping navigate their transitions and reframing their approach to well-being. This aligns with prior literature, as peer support has been cited in engineering mental health as a factor in student persistence and belonging [18], [19]. Prior studies have highlighted that engineering students tend to rely on their peers for mental health support more than official resources, which aligns with what our participants reported [3]. For students in higher education, community is built on a sense of belonging derived from openness and mutual interest, with literature highlighting the need to foster third places, and develop genuine dialogue, strong ties, and shared goal(s) to create that feeling [20].

For the developed strategies, students talked about shifting their mindset away from academic expectations. Students talked about shifting towards a growth mindset, or the belief that talents are developed “through hard work, good strategies, and input from others” [21]. This aligns with prior studies into the connection between growth mindset and student mental health, where individuals with a growth mindset have strong mental health and better self-actualization [22], [23]. While there is disagreement if the presence of a growth mindset predicts student success [24], [25], a growth mindset is one factor that contributes to the well-being of students within engineering. Replicable growth mindset interventions are a contested area in academia, but some literature states that a targeted attitude has the potential to change activity in classrooms, leading to a high adherence rate by both delivering and internalizing the activity [26].

Conclusions and Future Work

Our findings support the idea that undergraduate engineering students learn to prioritize their well-being and to shift their mindset towards a growth mindset through struggle, ultimately rebalancing the importance of academic results in their lives. These findings highlight the importance of community and identity development in fostering students' well-being and persistence in engineering programs. These findings also further create space for open conversations about mental health and for student-driven approaches that foster belonging and cultural transformation in engineering education.

Moving forward, the research team aims to use these stories to normalize the prioritization of mental health in engineering by developing advertisements and targeted interventions in classrooms to support a shift in classroom culture.

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