Engineering students and professionals living with a mental illness: an exploration of their experiences and challenges

Abstract— **Mental health has only recently come to the forefront of conversations in the media and academia. Mental health conditions are often triggered by environmental factors like academic stress, interpersonal conflicts, financial pressure, and career concerns. Students living with mental illness may drop out of college due to experiencing a mental health crisis at school. At the same time, engineering is a demanding profession that requires rigorous training. Therefore, the educational and professional experiences of engineers can be overexerting. This challenge can be even higher for engineering students and professionals who struggle with a diagnosed mental illness. Furthermore, the heightened stigma that surrounds mental illness might deter this group from seeking help and persisting in engineering. However, little is known about the experiences of people with a diagnosed mental illness while navigating the training and culture of engineering. Acknowledging and understanding the challenges faced by engineering students and professionals living with a mental illness is the first step towards implementing change in engineering education that would provide adequate support for these students to reach their goals.**

This *work-in-progress* reports on the first stage of a larger exploratory study aiming to describe the experiences of engineering students and professionals living with a mental illness and to understand how the engineering culture has impacted their experiences. Results will inform future research on student persistence and will inform engineering programs that want to support students who live with mental illness. Ultimately, this work will help eliminate stigma in engineering education and support the success of those living with mental health conditions.

Keywords— mental illness, stigma, support systems.

I. INTRODUCTION

According to 2016 estimates from the National Institute of Mental Illness (NIMH), in the U.S. almost one in five adults live with a mental illness. The prevalence of any mental illness among U.S. adults was higher among women (21.7%) than men (14.5%); it was also higher among young adults, 18-25 years (22.1%) than other age groups, 26-49 years (21.1%) and 50+ years (14.5%). In terms of race, individuals with 2 or more races have a higher prevalence of mental illness (26.5%) than any other race group. When focusing in adolescents, it is estimated that 49.5% of adolescents aged 13 to 18 had any mental disorder, and that 22.2% of them had a severe impairment. Anxiety disorders was the leading condition (31.9%), followed by behavior disorders (19.1%), mood disorders (14.3%), and substance use disorders (11.4%), with 40% of them having at least one condition. Evidence showing that common mental health conditions emerge before adulthood emphasize the need to make treatment more accessible for children and their families [1], [2].

As adolescents begin to think about and enter college, higher education institutions need to be prepared to provide adequate support for students' mental health and development. The Center for Collegiate Mental Health (CCMH), which analyzes data of more than 160,000 students seeking counseling services across 147 colleges and universities, has reported that during the period between Fall 2009 and Spring 2015 institutions experienced an average of 30% - 40% increase in the utilization of counseling centers while enrollment in such institutions only grew 5%. The CCMH has also identified anxiety and depression as the most commonly presented concerns and an increasing prevalence of issues related to self-threat (non-suicidal, serious suicidal, self-injury, and suicide attempts) [3].

While research provides a general context for the state of mental health at the undergraduate level, engineering specific studies to gauge this issue are scarce. One study addressing this void was recently presented by Danowitz and Beddoes [4]. The researchers analyzed the prevalence of mental health issues among engineering students at California Polytechnic State University. Their analysis of 800 validated surveys indicated that engineering students were about twice as likely to experience anxiety, depression, and PTSD symptoms than other students. The authors recognize that self-selection bias may have been a factor in the results; however, the study still highlights a need for wide-scale studies of these issues in engineering. Cross-institutional engineering-specific studies that can provide additional evidence for understanding the mental health challenges faced by students are necessary in order to advance adequate support structures and programs.

The objective of this work-in-progress is to present an on-going research project analyzing the relationship between the field of engineering, its culture, and the experiences of those living with a diagnosed mental health condition. This study serves as a starting point for transforming engineering into a more inclusive space where mental illness does not pose a de facto limitation to engineering success. This exploratory work aims to discover ways in which the engineering education research community can begin to broaden its understanding of mental health conditions and experiences of students, professionals, and eventually faculty, staff, and administrators who live with mental illnesses.

This research is part of a larger project aiming to explore the experiences of more than twenty engineering students or

978-1-7281-1746-1/19/$31.00 ©2019 IEEE

practitioners in order to answer the following research questions:

- what are the challenges faced by people diagnosed with a mental illness as they perform as engineering students and practitioners?
- what strategies have they developed to overcome such challenges?
- what types or structures of support have they had or do they have available to navigate such challenges?

II. Theoretical Framework

Narrative inquiry focuses on understanding the living stories and experiences of others, making place for new insights of how something happen [5]. In this sense, narrative inquiry can be more than a simple research method, it can be considered a frame of reference to build new knowledge [5]. This perspective aligns with Vygotsky's sociocultural theory, in which human learning and development is invariably shaped by social and cultural contexts [6]. Therefore, narratives are essential part to understand student's experiences and can be used as a map to recognize their hurdles. For this study, we adhere to this sociocultural foundation of narrative inquiry, making it an appropriate lens of analysis of our phenomena of interest.

A. Research Design

This exploratory study includes four populations: a) current or early graduates of an engineering program, b) graduate students in traditional engineering programs, c) early career practicing engineers and, d) late career practicing or retired engineers, all of them with a diagnosed mental illness. The final objective is to explore the experiences of about 20 participants across all these three groups through their narratives. The envisioned goal is to develop an initial understanding of their experiences throughout their studies and practice of engineering. This work in progress reports on one story, of a subject belonging to the last category described.

B. Data Collection

The study was conducted in partnership with the National Alliance of Mental Illness (NAMI), a grassroots organization dedicated to improving the lives of millions of Americans living with mental illness and their families through education and advocacy [7]. Two of the authors, who are NAMI members, collaborated with leaders with a NAMI chapter in the Midwest and with a NAMI campus chapter at a midwestern institution to recruit participants. Because the study is targeting a potentially vulnerable population, working with NAMI was the only recruitment method allowed by the Institutional Review Board. Therefore, the study used a convenience sampling framework. There were several benefits to using this recruitment strategy. First, NAMI members are more likely to be seeking treatment for their mental health condition. Second, they often talk openly about their illness because of a variety of programs in the organization that encourage mutual support of members through verbally sharing their stories.

Semi structured interviews were used to gather information based on the main inquiries: "when and why did you decide to become an engineer?" and "tell me your story". Additional clarification questions were asked as needed. This allowed the participants to shape their story in whatever format they preferred.

Interviews were audio recorded, professionally transcribed, and verified for accuracy against the original recording. Analysis was conducted through multiple readings of the original transcript and the identification of main elements pertaining to the experiences of living with mental illness, ranging from the participants perceptions of mental illness before their diagnosis to the onset of their illness to challenges while studying/working in engineering while experiencing their illness to structures of support, and many others.

C. Data Analysis

The study utilizes narrative analysis, a qualitative method within the broader definition of narrative inquiry [8]. Narrative analysis aims to find specific elements shared by multiple narratives as well as their main differences. While some distinctions have been made between narrative analysis and the analysis of narratives [8], this study does not distinguish between the two. Narrative analysis is achieved by multiple readings of the narratives and identification of unique elements as well as patterns across the different narratives. At this point, three interviews have been conducted; however, the richness of the three narrated experiences goes beyond the scope of this paper. Therefore, this work-in-progress is limited to the results of one participant's narrative. Analysis of other narratives is being conducted and will result in a robust comparison of experiences. The following is Jack's story.

III. Jack's story

Jack is a late career engineer, with more than 25 years of experience working for a variety of companies and projects, as well as independently. He was able to reflect on his engineering training in the late 1970's and how they contrasted with his perceptions of current holistic and balanced training, where engineering students are encouraged to do way more outside of the classroom.

Reflecting on his understanding of mental illness before his own diagnosis, Jack remembered having witnessed the passing of his dad when he was ten years old and seeing his mom experience a nervous breakdown, for which she was hospitalized and treated with electroconvulsive therapy. He recalled his mom not being able to recognize him when he would visit her at the hospital. That idea of a mentally ill person stayed with him until he was diagnosed and finally educated about his condition.

Jack remembers his path to engineering as a natural transition, given his noted talents in math and science. He was encouraged by his high school teachers to pursue a career in engineering, as well as by his older brother, who was already pursuing electrical engineering. Upon receiving a scholarship

to a local university, he pursued an electrical engineering degree and completed it in the expected four years. During his college years, he was driven mainly by grades and did not pay a lot of attention to extra-curricular activities. because he believed they would have distracted him from achieving academic excellence. He also attributed some of this fixation on grades to his own upbringing within a particular European culture in his household. From his early years, he would be scolded for not maintaining straight As, and this translated into an expectation for excellence that he would pursue at any cost. It was not until many years in his practicing career that he was able to reflect on how such mentality hindered his own development and affected his mental health, and how those grades did not matter to him anymore.

He now recognizes that he started experiencing depression during his senior year of college. However, instead of working on his mental health, he kept his struggles to himself. Because of the impressions he developed about mental illness based on his experience with his mom, he refused to consider the possibility of having a mental illness. Additional societal stigma about "craziness," portrayed in movies like One Flew Over the Cuckoo's Nest, solidified his desire to distance himself from being labelled as "crazy." No discussions about depression, or how to handle stress were held on his campus. Nobody talked about long term effects of these issues. Instead, he focused on school even more, and opted to just live by himself in his apartment, thinking things would get better after graduation. Once he graduated, Jack obtained his first job at a large engineering firm and moved outside his home state, far from his family, friends and his girlfriend at that time. His decision to take this position was mainly driven by the fact that it was the closest out-of-state location from his girlfriend and family compared to his other offers.

Jack quickly started feeling alienated due to the overwhelming size of the company and the fact that he was not able to make connections in the new place. While he was expecting to be approached by other engineers to just say hi and know each other, he found that they were all quite "down to business," and the engineering culture at the company did not promote a lot of socializing. The lack of opportunities to socialize compounded his mental health issues, and by the end of that year, he was going through depression-anxiety cycles that hindered his ability to function effectively. Not knowing anything about mental health, he thought he was "going crazy" and did not know who to reach out to. In particular, the tension between being a recent graduate from a prestigious engineering school and not being able to cope with basic functions such as reading the news was weighing heavily on his sense of confidence and worth.

The point came where he could no longer function at work, and he secluded himself in his apartment. He also ended his romantic relationship because he did not want to be a burden to his girlfriend. The few connections that he was able to make at work demonstrated concern, but it was only when his family came to visit him that he was persuaded to pursue treatment. He then spent a month in a lock down suicide unit at the hospital, although he did not recall being suicidal. Thinking about the people he saw there, he remembered thinking "This is not me," "I am not like that," and "I am not giving up."

He was treated with antidepressants that had a significant number of side effects. Being institutionalized was a constant fear, and he remembered thinking: "(If) I don't get better, they (the doctors) might lock me up somewhere and I might never get a real shot in anything in life, and I did not want that to happen." He recognizes that he had the privileges of good insurance, and a supportive family to go through this process. He resorted to music to clear up voices in his head and running became another strategy he adopted as therapy.

The road to recovery was difficult for Jack, and he struggled with adhering to the lifestyle changes needed to be successful. He flushed his medication down the toilet a couple of times and resented "not being like other guys" his age, especially with respect to not being able to drink alcohol due to medication restrictions. Despite his available support system, he tried to ride many of the challenges by himself and concealed many things from his family. In fact, he remembered taking therapy, but not really engaging with it beyond listening to his therapist.

Jack was able to return to his job after his month-long hospitalization but noticed differences in how he was treated. His supervisors worried the job "broke him," so they started to give him less challenging tasks which felt empty or meaningless to him. While he still felt part of his work organization, he eventually experienced an internal conflict between his philosophy and the company's mission and ended up leaving after one more year. He looked to relocate back to his home state because he valued his family and other structures of support. Getting back on the job market was challenging for Jack because he lost a lot of his self-confidence based on his mental health issues. He once found himself crying in front of a recruiter during a job interview. Most of his lack of self-confidence was derived from not knowing what long-term mental illness meant and how to deal with it. Throughout time he had different jobs and learned how to accept and manage his illness. He educated himself about depression and learned how he could handle it in order to have a productive and healthy life. He stuck to his treatment, which included medication. By then he was able to hold down jobs and make significant contributions to them.

Thirteen years later, due to changes in his medication, Jack started experiencing manic episodes which turned psychotic. Since then his diagnosis now includes bipolar disorder, but fortunately, he still had the necessary support from family to help him get timely help. He was able to educate himself about the condition and thrive in managing his new treatment.

Referring to his experiences working with different employers while living with mental illness, he recalled having all levels of support. He recognized that small companies were usually more understanding, and consequently he would become a loyal and more devoted employee. His technical skills usually outweighed his health issues, therefore he never felt forced to disclose. Once he recovered his self-confidence his attitude about disclosing was: "it is not their business, I can do my job," and he usually got the jobs he interviewed for based on his abilities and a positive attitude towards new challenges, from which he never shied away (e.g. learning new coding languages "on-the-fly"). However, he was conscious of his potential limitations, stating "well that is my ability right now, but I don't know what's gonna happen down the road," and sometimes things would creep up and he would need to talk to HR (human resources) to explain some behaviors related to his illness.

Reflecting back on what he would change and what he would suggest to the new generations of engineering students, he believes that being more well-rounded and not being focused only in academics is a key. Learning what are your talents are and finding things that you enjoy beyond school is valuable to understand yourself and learn to deal with failure when it comes.

IV. Discussion and Future work

Jack's story provide some answers to the presented research questions. Further evidence will be analyzed through the described project and would allow to compare many more stories of different engineering students and professionals. First, Jack's story begins to reveal some elements of the engineering culture that might result challenging for people living with mental illness. From what he remembered of his undergraduate training he never engaged in extracurricular activities that might have helped him develop non-technical skills to deal with his illness. In addition, the culture of his first engineering job after graduation was isolating because it focused too much on the technical aspects, letting him vulnerable in a new environment and heightening his mental illness. This evidence can contribute to the current controversy about rigor in engineering education and how technical skills are prioritized over many other skills that could also benefit engineering work [9].

Second, despite having a rough time getting to accept his illness, once he understood his condition and identified ways to manage it, he could separate his professional persona from his illness. In this way, he regained confidence as an engineer. Stigma is still one of the most difficult challenges to be tackled when dealing with mental illness and the main barrier to help-seeking behaviors among college students [10] as well as among older adults [11]. There are opportunities for educators to start challenging stigma of mental illness in engineering by identifying elements that could support students with such conditions. These opportunities include the use of Universal Design approaches, where such conditions and their limitations can be considered for student success [12]. Third and finally, he was able to recognize a variety of support structures that he had available, such as supporting family, good health insurance, and jobs that were understanding of his condition. None of them were in the academic space. Jack recalled that there was no culture of mental health at his undergraduate institution, and nobody talked about what mental illness was or ways to handle it. Comparing it to the current availability of structures such as NAMI, he believes similar spaces would have helped him to understand and accept his own condition earlier.

From these insights many questions are still derived. For example, how Jack's personal characteristics helped or hindered his ability to deal with the challenges related to mental illness? By analyzing the first interview of a female engineer we found that gender played a more significant role within a culture that she perceived excluded her, even further complicating the management of her mental health. I would be expected to find similar experiences among other non-conforming groups in engineering. Similarly, the access to adequate treatment might be different for people with different socioeconomic backgrounds. It is clear that individuals' experiences will vary depending on several factors, while others will have shared experiences. However, the unifying experience in all of the stories is how being an engineering relates to living with a mental health condition.

This is the first time researchers have illustrated the rich experiences of engineers living with a mental illness. Ultimately, the engineering education research community can work together to eliminate the stigma so many students and professionals face.

Acknowledgment

The authors are thankful to the National Alliance of Mental Illness for their collaboration on reaching out to participants for this study. Also, to the three participants already interviewed.

References

[1] K. R. Merikangas *et al.*, "Lifetime prevalence of mental disorders in U.S. adolescents: results from the National Comorbidity Survey Replication--Adolescent Supplement (NCS-A)," *J. Am. Acad. Child Adolesc. Psychiatry*, vol. 49, no. 10, pp. 980–989, Oct. 2010.

[2] "NIMH » Mental Illness." [Online]. Available: https://www.nimh.nih.gov/health/statistics/mental-illness.shtml. [Accessed: 03-Dec-2018].

[3] "Center for Collegiate Mental Health (CCMH) 2017 Annual Report," Penn State, STA 18-166, Jan. 2018.

[4] A. Danowitz and K. Beddoes, "Characterizing Mental Health and Wellness in Students Across Engineering Disciplines," presented at the 2018 CoNECD - The Collaborative Network for Engineering and Computing Diversity Conference, 2018.

[5] F. M. Connelly and D. J. Clandinin, "Stories of Experience and Narrative Inquiry," *Educ. Res.*, vol. 19, no. 5, pp. 2–14, Jun. 1990.

[6] T. Moen, "Reflections on the Narrative Research Approach," *Int. J. Qual. Methods*, vol. 5, no. 4, pp. 56–69, Dec. 2006.

[7] "About NAMI | NAMI: National Alliance on Mental Illness." [Online]. Available: https://www.nami.org/About-NAMI. [Accessed: 15-Apr-2019].

[8] D. E. Polkinghorne, "Narrative configuration in qualitative analysis," *Int. J. Qual. Stud. Educ.*, vol. 8, no. 1, pp. 5–23, Jan. 1995.

[9] D. Riley, "Rigor/Us: Building Boundaries and Disciplining Diversity with Standards of Merit," *Eng. Stud.*, vol. 9, no. 3, pp. 249–265, Sep. 2017.
[10] D. Eisenberg, M. F. Downs, E. Golberstein, and K. Zivin, "Stigma and Help Seeking for Mental Health Among College Students," *Med. Care Res. Rev.*, vol. 66, no. 5, pp. 522–541, Oct. 2009.
[11] K. O. Conner *et al.*, "Mental Health Treatment Seeking Among Older Adults With Depression: The Impact of Stigma and Race," *Am. J. Geriatr. Psychiatry*, vol. 18, no. 6, pp. 531–543, Jun. 2010.
[12] T. Dolmage, *Academic Ableism.* University of Michigan Press, 2017.