

Exploring Undergraduate Engineering Students' Definitions of Mental Health

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Abstract—This full research paper describes undergraduate students' definitions of mental health in order to advance understanding about what the term 'mental health' means to undergraduate engineering students. Recent studies have called attention to the worsening mental health amongst college students, particularly engineering students. Studies have connected these worsening mental health conditions to the high-stress culture of engineering. However, most research approaches mental health from its clinical definition, most often using established instruments to look for stress, anxiety, and depression among undergraduate students. At the same time, 'mental health' has been increasingly used colloquially by students in less clinical ways. In order to gain qualitatively rich understandings of how engineering students' mental health is impacted by the culture of undergraduate engineering, we must understand what students mean when they say, 'mental health.' This paper draws on a larger research study that interviewed 21 undergraduate engineering students about their mental health and experiences in engineering. Participants are from one comprehensive, research-intensive university in the Midwest, and all participants hold at least one identity that has been historically marginalized in engineering (e.g., gender, race, socioeconomic status, sexual orientation). This paper focuses on students' answers to the interview question: "How do you define mental health? What does mental health mean to you?" We pose the research question: How do undergraduate engineering students define mental health? We draw on Braun & Clarke's (2022) reflexive thematic analysis to generate themes that describe students' definitions of mental health. The results of this work are expected to add to the ongoing conversation about the mental health of undergraduate engineering students. Moreover, this work will open new avenues for qualitatively exploring the mental health of undergraduate engineering students from a more holistic lens, which will add to ongoing research that adopts a clinical lens.

Keywords—mental health, undergraduate engineering students

I. INTRODUCTION

Mental health issues among undergraduate students have garnered increasing attention in recent years, reflecting a growing concern in academia and beyond. Lipson et al. [1] conducted a longitudinal study involving 350,000 diverse undergraduates nationwide and found that various mental health conditions (e.g., depression, anxiety, and suicidal ideation) have increased drastically between 2013 and 2021. Despite the exacerbation of these concerns by the COVID-19 pandemic [2], it is essential to note that mental health concerns were on the rise even before this mental health crisis [3], [4].

Within this broader context, engineering students emerge as a particularly vulnerable population. A study by Foster and Spencer [5] underscored the perception among engineering students that their mental health is comparatively poorer than that of their peers in other disciplines. Alarming, many engineering students have come to accept poor mental health as an inherent aspect of their academic journey [6]. Compounding this issue is the reluctance among engineering students to seek professional help for their mental health struggles compared to other undergraduates [7], [8]. This reluctance raises significant concerns about the well-being of engineering students and necessitates a deeper understanding of their unique experiences and perceptions regarding mental health.

While mental health in engineering education has gained attention recently, existing studies primarily approach the topic from a clinical standpoint, focusing on diagnosable conditions such as anxiety and depression. However, there exists a critical gap in the literature regarding engineering students' informal definitions and perceptions of mental health. Understanding how engineering undergraduates conceptualize mental health is essential for accurately assessing the impact of their educational experience on their well-being, thus carrying significant implications for student persistence and retention in the field.

Accordingly, this study addresses this gap by exploring how undergraduate engineering students define mental health. We posit the following research question: How do undergraduate engineering students define mental health? By delving into students' perceptions and understandings of mental health, we seek to gain a qualitatively rich understanding that can inform future research and interventions to promote the well-being of engineering students. This exploration not only contributes to the broader conversation on mental health in engineering education but also lays the groundwork for future studies that adopt a more holistic approach to understanding and supporting the mental health needs of students.

II. BACKGROUND

To understand how students' definitions of mental health compare to existing definitions, we must first review literature definitions of mental health. Historically, mental health has been defined with respect to mental illness. According to Asghar and Minichiello [9], society has unintentionally adopted the term mental health, across colloquial, academic, and scientific contexts, solely to describe or suggest negative conditions of the human mind. For over a century, psychological research has conflated mental health with mental illness, leading to the tacit

agreement that mental health is solely defined by the presence or absence of suffering [10]. Asghar and Minichiello thus argued that this approach to mental health is “failing to acknowledge both sides of the human psyche—one negative and one positive.”

Consequently, there have been attempts by scholars across psychology, health and education fields to define mental health. From the shift of the focus on just the absence of illness, the World Health Organization has defined mental health as “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” [11]. According to Lamers et al. [12], three components exist in this definition to make up mental health, “well-being, effective functioning in individuals’ life and effective functioning in community life.”

The two primary traditions around which studies of well-being are conceptualized are the hedonic tradition and the eudaimonic tradition [12]. The hedonic tradition is defined as the “presence or absence of negative affect” [13]. In this tradition, the focus is on happiness, and is hinged on the concept of subjective well-being [14]. Well-being in this hedonic tradition is considered subjective because it involves individuals assessing their own sense of wellness and interpreting their personal well-being [13]. However, a second perspective views well-being as more than just happiness, suggesting that people who are happy or exhibit positive affect and satisfaction may not necessarily be psychologically well [13]. This perspective gave rise to the eudaimonic tradition [15]. The eudaimonia tradition centers on living a life that is rich and profoundly fulfilling [13], the eudaimonia “equates mental health with human potential that, when realized, results in positive functioning in life” [16]. This perspective views well-being not as a final outcome or end state, but as a continuous process of realizing one’s true nature. It involves actualizing one’s virtuous potentials and living in a way that aligns with one’s inherent purpose” [13]. Deci and Ryan [13] suggest that there is a notable intersection between hedonia and eudaimonia. They also refer to Walter et al. [17] who argue that adopting a eudaimonic lifestyle inevitably leads to experiencing hedonic pleasure; yet, not all instances of hedonic pleasure are derived from eudaimonic living.

Galderisi [18] argued that while the World Health Organization’s definition of mental health represents significant progress by shifting the focus from solely mental illness, it still has potential for misunderstanding. Specifically, identifying positive feelings and positive functioning as key factors for mental health can be problematic. Galderisi [18] points out that life’s challenging circumstances make it difficult to see well-being as a definitive aspect of mental health. They further emphasized that individuals with good mental health can often experience sadness, anger, and other negative emotions, while an individual who is impaired from working may be wrongfully deemed as not being in good mental health. Galderisi as well as Vaillant [19] highlighted the need to also define mental health in terms that are culturally sensitive and inclusive.

Galderisi et al. [18] in recognizing that variations in values, cultures, and social backgrounds across countries may impede the establishment of a universal consensus on the concept of mental

health, developed an inclusive definition devoid of restrictive and culture-specific statements. They defined mental health as:

A dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society. Basic cognitive and social skills; ability to recognize, express and modulate one’s own emotions, as well as empathize with others; flexibility and ability to cope with adverse life events and function in social roles; and harmonious relationship between body and mind represent important components of mental health which contribute, to varying degrees, to the state of internal equilibrium.

According to Galderisi et al. [18], their definition moves beyond perspectives rooted in ideal norms or hedonic and eudaimonic traditions. It advocates for an inclusive approach that avoids restrictive and culture-specific statements, striving to align closely with the human experience, which is multifaceted, encompassing moments of joy as well as times of sadness, disgust, or fear; it can be fulfilling at times or unsatisfactory at other times.

Mental health studies in engineering education have typically focused on negative indicators of mental health such as stress, anxiety, depression [20], [21]; anxiety and depression [22]; depression, anxiety, suicidality, and self-injury [7]; eating disorders, depression, anxiety, post-traumatic stress disorder (PTSD) [23]; attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, bipolar disorder, depression, obsessive-compulsive disorder (OCD), and PTSD [24]. However, Asghar and Minichiello [9] acknowledged that there is a need for engineering educators to adopt a definition that “carries with it a double-sided (i.e., negative and positive) view of mental health to serve a more general and holistic purpose of promoting human flourishing.” They adopted the definition of mental health by Brown [25]: “Having the emotional resilience to cope with everyday pressures, enjoy life, and undertake productive work while having a belief in one’s own and others’ worth. It is not just the absence of a mental illness: one can have good mental wellbeing yet have a diagnosed mental illness.”

III. THEORETICAL FRAMEWORK

We draw on Vaillant’s [19] article, which conceptualizes seven models for positive mental health, as the framework for this study. The definitions identified in [19] will be used as a literature benchmark with which to compare participant definitions of mental health. By comparing literature definitions to participant definitions, we are able to identify the ways in which students’ understandings of mental health converge and diverge with common literature-based definitions. This comparison can then yield insights into what students mean when they discuss mental health.

TABLE I. POSITIVE MENTAL HEALTH DEFINITIONS

Positive Mental Health Definitions [19]	
1	Mental health as above normal, defined by a GAF score of over 80
2	Mental health as the presence of multiple human strengths
3	Mental health as maturity
4	Mental health as positive emotions
5	Mental health as socio-emotional intelligence
6	Mental health as subjective well-being
7	Mental health as resilience

IV. METHODS

To answer the research question, this study pulls from a broader research study to explore undergraduate engineering students' perspectives on the intersection of engineering school and mental health. Of the hour-long semi-structured interviews, one interview protocol question asked students, "When we say, 'your mental health,' what does that mean to you?" This question aimed to have students define the concept of mental health in their own way, as 'mental health' is often used colloquially today.

A. Participants

The broader study conducted hour-long semi-structured interviews with 21 undergraduate engineering students at a large, public, land-grant university in the Midwest. These 21 participants were recruited based on their identities, as this study focused on students with at least one traditionally minoritized identity in engineering (i.e., not white, not heterosexual, not cisgender man, and low-income/first-generation college students) [26]. The recruitment process involved flyers posted around engineering buildings and recruitment emails distributed by individual engineering departments. Participants were compensated with a \$30 Visa for participating in the study.

TABLE II. IDENTITIES OF PARTICIPANTS

First-Generation College Student				7	
Gender Identity	Not cisgender man				16
Sexual Identity	Not straight				10
Racial Identity	Not white				6
Low-Income	<\$70,000				7
Year in School	1	2	3		4
	4	7	4		6

B. Site Description

The study took place at a large, public, land-grant university in the Midwest. At this university, most syllabi include a reference to the university's mental health and well-being resources. The two primary resources advertised to students are a free, short-term counseling model catered towards crisis support, and one-on-one well-being coaching. The counseling sessions are offered to individuals in private or group settings and led by a multidisciplinary team of psychologists and counselors. The well-being coaching aims to provide students with help practicing

resilience, self-compassion, along with where to find additional support for their concerns.

C. Data Collection & Analysis

Each interview was conducted in person or over Zoom, with audio recordings. The audio recordings were professionally transcribed, and the responses to the question asking participants to explain what mental health means to them were selected. These responses were then independently coded using an In Vivo coding process by Authors 1 and 2 [27]. Each author added one of three subcodes to their In Vivo codes to further narrow the analysis [27]. Author 1's subcodes were positive, negative, or neutral, and Author 2's subcodes were struggle, fluid, and well-being. Upon establishing these subcodes, the entire author team met to crystallize fitting themes using Braun & Clarke's reflexive thematic analysis [28] of the existing codes. Last, the author team deductively coded the transcripts using the established themes as the codebook to verify saliency. Any discrepancies between authors were discussed to reach a consensus.

D. Positionality of Authors

Authors 1 and 2 are undergraduate student researchers, advised by Author 4. Author 1 is a junior mechanical engineering student with nearly two years of research experience, and Author 2 is a sophomore civil engineering student with six months of research experience. Author 3 is a PhD student in the department of mechanical and materials engineering specializing in engineering education research. Author 4 is an Assistant Professor of Mechanical Engineering, received her Ph.D. in Engineering Education, and conducts engineering education research. Authors 1, 2 and 4 identify as white women while Author 3 identifies as an African male. Authors 1 and 2's positionality as undergraduate students with at least one minoritized identity means they are currently undergoing the same educational experience as participants from a similar positionality. They were able to use this perspective as a lens for understanding the interview data. Authors 1 and 2 performed the majority of the data analysis and met regularly with Authors 3 and 4 to discuss their progress and findings.

V. FINDINGS

A summary of the findings is provided in Table III and discussed below. Saliency was defined by the presence of a particular code (i.e., fluid, about holistic well-being, about struggle, or about advocacy) in the participants' definitions and is reported as the percentage of interviews that the code appears in. Many participants' definitions included multiple codes, and each participant's definition included at least one code.

TABLE III. SUMMARY OF FINDINGS

Mental health is...	Definition	Saliency
... fluid	Mental health is dependent on the situation, individual, and time. Mental health is ever-changing and requires constant effort.	62%
...about holistic well-being.	Mental health is an overall positive entity and means maintaining mental well-being through physical and emotional actions.	62%
... about struggle.	Mental health causes great challenges and can be severely debilitating. Clinical mental illnesses have great impacts.	38%
... about advocacy.	Mental health requires mutual support , open discussion, as well as constant effort.	14%

A. Mental health is about holistic well-being.

Holistic well-being is the idea that mental health revolves around physical, mental, and emotional well-being. Students whose perspectives were marked with holistic well-being defined or categorized mental health as having clarity, positivity, and motivation within all aspects of life. Findings, as shown in Table III, revealed that 62% of participants' mental health perspectives fell under the category of holistic well-being. Participant 15 shared their perspective on mental health:

We talk a lot about things like physical health and eating healthy and exercising and you know, not just sitting in front of your computer all day. So mental health is kind of like the flip side of that. It's the internal well-being, it's the well-being that like, you wish there was a little window that you could investigate and see how it's doing.

This response fully embodies holistic well-being. The crucial aspect of Participant 15's response is the idea of mental health tying into 'well-being' as well as being on the 'flip side' of physical health. Over the years, mental health has gained a stigma with a negative connotation. Participant 15 broke the stigma with their perspective, saying that mental health is internal well-being, similar to eating healthy and having good physical health. This mental health definition shows engineering students' perspectives in a brighter light as they view their mental health positively.

B. Mental health is about struggle.

Struggle is the idea that mental health revolves around something hindering mental capabilities through many different means. Students whose perspectives were marked with struggle defined or categorized mental health as having constraints holding them back, for example, depression, anxiety, panic attacks, overwhelming mental clutter, etc. Findings, as seen in Table III, showed that 38% of participants' mental health perspectives were marked under the category of struggle. This alarming percentage shows that a considerable amount of engineering students view their mental health as hindering or debilitating to their capabilities. A perspective under the scope of struggle is seen through Participant 20's perspective:

It's like, the physical form of being like tired or hurt or whatever. But just like your emotions. And to me I guess mental well-being would be not being super like stressed out not being depressed, like that, that sort of thing and trying to like work on your like, like, for me, it's a lot of like, work life balance because I'm a workaholic.

Participant 20's initial perspective of mental health is the emotional form of being tired or hurt. However, Participant 20 backtracked to their definition of mental well-being as not being stressed or depressed. This explanation provides insight into the split-second emotion that the words "mental health" invokes within young adults of this generation. Mental health invokes a negative connotation associated with struggle among many participants, whereas "mental well-being" invokes a more positive emotion within most of the participants. Participant 7's perspective also resonated with struggle:

So I would describe mental health as, I feel like anybody can struggle mentally, but there's some different forms of it. So like, you can maybe have some anxiety, but it may be just come and go. For me, I feel like mental health is something that's so severe that it stops your way of life or stops your success in like college or work or anything.

Participant 7's perspective dived deep into how mental health invokes an emotion that is associated with struggle. Participant 7, as well as a few others, shared how mental health is something that could even go so far as to be debilitating.

C. Mental health is fluid

Mental health being fluid is the idea that mental health is ever-changing depending on the situation, person, and effort. Students whose perspectives were marked with fluid defined or categorized mental health as something that can often change depending on different situations and constraints. Findings, as seen in Table III, show that 62% of participants see mental health as something that is fluid and can be changed depending on outside factors. Within this, we can see that, along with being changed by outside factors, it can be exercised or worked to maintain. Participant 17 shares their perspective:

My mental health has been something that I had to work really hard, in order to, I don't know if 'treat' is the right word, but I've definitely like been going through like different experiences as far as my mental health these past few years.

This perspective shows a different side of mental health than was previously shown. Participant 17's perspective plays with the idea that mental health requires relentless work to maintain. In contrast to struggling or well-being, mental health could perhaps be both. This perspective gives some leeway for the rest of the participants, who talk about how mental health is lenient on physical health and many other impacts, along with advocacy being an essential part of mental health.

D. Mental health is about advocacy.

Advocacy within the scope of mental health is being unafraid to speak out, offer help, and get help for oneself or others. Students whose perspectives were marked by advocacy mentioned that mental health is something people need to be able to speak about and be unafraid of. Moreover, findings, as seen in Table III, show that only 14% of participants mentioned that mental health needs advocacy or defined themselves as a mental health advocate. Participant 18 shared their perspective:

People get yearly physical checkups. I think people should get yearly mental checkups. And I think experiences with mental health can be both your own like how you feel about it, how you act about it, what you are currently dealing with mentally,

as well as the outside influences that you have on your mental health and their opinions on mental health [...] And for me, I think I am definitely a mental health advocate. I think mental health is physical health, and they impact each other very greatly.

Participant 18's definition of mental health also provides a new perspective on how they consider themselves a mental health advocate. This perspective shines a light on the importance of advocacy for mental health. Raising awareness around mental health is vital within the scope of engineering students and being a support system for those around them.

VI. DISCUSSION

To further ground the findings of this study, the themes found by the author team are compared to the theoretical framework in the form of definitions of positive mental health found in Vaillant's article [19].

A. *Mental health as above normal, epitomized by a GAF score of over 80.*

The first definition found in Table I regards an above-normal score on the Global Assessment of Functioning (GAF) scale. This scale was established to be used by experts in the field to quantify any life impairment caused by mental health. This scale ranges from 0 to 100, with 100 alluding to a lack of negative mental health symptoms, superior functioning, and no unreasonable life problems inflicted by the patient's mental state. This numerical method used to define positive mental health does not align with any of the perspectives of the participants of this study since no participants referenced any quantifiable measure of mental health.

B. *Mental health as the presence of multiple human strengths.*

The second definition, which aligns with positive psychology, looks for what strengths an individual possesses. The specific strengths in the mental health space, however, have not been completely agreed upon. Vaillant's article mentions strengths such as, "wisdom, kindness, and the capacity to love and be loved" [9]. Of these specific traits, there is little alignment with the findings of this specific study, as participants who mentioned concepts aligned with the idea of strengths spoke of attributes such as perseverance and optimism. Some participants of this study linked the ability to complete the day's tasks as being a sign of good mental health; however, any mention of attributes such as wisdom or kindness was not made.

While there is no definitive definition of mental health, the presence of depth in understanding the complexities of the topic may be beneficial for individuals who may not prioritize their mental health. Many participants suggested that mental health plays a significant role in one's life, yet these less concrete strengths and ideas (i.e., the capacity to love and be loved) were not mentioned. To improve students' perspectives on mental health, with the goal that information on the topic may lead to an improvement in managing one's mental health, institutions should discuss the topic with more depth and purpose. Although there are resources available to students at most universities, it is important to make mental health a comfortable topic of conversation where depth can be attained for the well-being of students. If students suggest that surviving their daily tasks means

mental health, there must be more to consider about the importance of additional institutional support.

C. *Mental health as maturity.*

Vaillant's article mentions many papers that suggest positive mental health and maturity are directly related. Throughout a human life, an organ may be at optimal functionality in youth, but the central nervous system is best much later. Due to these connections between maturity and mental health, maturity is included as an empirical model of mental health in Vaillant's article [19]. Reflecting on the participants of this study, no one referenced maturity in their explanation. Understanding that most of these participants are between the ages of 18-22, it is not expected that they would recognize maturity as a component of mental health. However, it is worth noting that the eldest participant, a non-traditional student, offered the most dynamic/complex definition of their experience with mental health over the years.

D. *Mental health as positive emotions.*

Love, hope, joy, forgiveness, compassion, faith, awe, and gratitude are the eight positive emotions mentioned in Vaillant's model [19]. Each of these emotions are related to good mental health and are all future-oriented and involve human connection. Of this study, a few participants mentioned positive emotions such as feeling empowered, being happy, and positivity in relation to what mental health means to them. While none of the positive emotions shared by the participants directly correlate to any of the eight defined by Vaillant, some parallels exist. Aside from the few participants who mentioned positive emotions, many participants connected their definition of mental health to negative (or lack thereof) feelings. Of these feelings include a lack of self-worth, exhaustion, feeling burdened, anxiety, depression, pain, and negativity. Due to the overwhelming number of definitions with a negative foundation, concern is raised about participant's ability to see the positive side of mental health. Engineering students are often seen as individuals with higher risks of mental health concerns, so it makes sense that it may be more challenging for them to experience good mental health at this point in their life. Bad mental health may be seen as the norm for undergraduate engineering students.

E. *Mental health as socio-emotional intelligence.*

Socio-emotional intelligence regards the perception and regulation of one's emotions, along with proper perception and response to other's emotions. Vaillant suggests that a person with a high IQ has high intellectual aptitude, the same way that a person with high socio-emotional intelligence has above average mental health. In this study, no participants made any direct connection to socio-emotional intelligence being a model of mental health; however, five of the participants mentioned mental health connecting to the ability to process one's day-to-day life and one's general attitude towards their life.

F. *Mental health as subjective well-being.*

While a foolproof measure of subjective well-being has not been fully agreed upon, Vaillant suggests that asking someone how they feel about their life holistically, on a scale of one (terrible) and seven (delighted), can give reliable insights [19]. The majority (approximately 62%) of participants in this study connected their definition of mental health with their subjective

well-being. Moreover, many participants made the connection between mental and physical health in how they both impact each other and are just as important as each other. Most participants recognized that when your mental health is poor, your general quality of life decreases, and vice versa.

G. Mental health as resilience.

Resilience is loosely defined by Valliant as the ability to overcome stressful situations. In establishing the last model of mental health, resilience is considered due to its role in mature, involuntary coping mechanisms and impact on mental health. Resilience is a trait that is difficult to quantify but still an important facet of one's overall mental health. The participants in this study did not mention resilience directly in their definition of mental health; however, five participants mentioned how mental health and one's mindset or attitude are connected. It may be argued that one's mindset or attitude could impact the conscious, voluntary coping mechanisms that could impact one's resilience.

VII. CONCLUSION AND FUTURE WORK

The findings of this study reveal that 38% of the 21 participants primarily associate mental health as a hindrance to reaching their full potential. This negative perception can lead to adverse consequences for engineering students, as understanding the value of good mental health is paramount. Engineering is widely accepted as an academically challenging major, and the hardships endured throughout the degree can negatively impact students' physical and mental well-being. Considering these challenges, institutions need to understand the importance of investing in mental health education and support.

Using Valliant's article as a framework for the definition of mental health allowed the participant's responses to be compared to a comprehensive understanding of the term. Valliant used seven empirical models of mental health in order to describe the concept in a variety of contexts. While a 'correct' definition of mental health does not exist, this paper aimed to explore the perceptions of students in what mental health meant to them. The participants illustrated a weak alignment with the models posed in Valliant's article. Most participants described mental health as pertaining to struggle, one's attitude, and one's general well-being. While these descriptions may loosely fit into Valliant's models, there is an opportunity for students to better understand what positive mental health could look like in their lives. That is, good mental health is more than the ability to survive the day's tasks.

Several students acknowledged that mental health is equally as important as physical health, and that both mental and physical health have great effects on each other. Universities are currently equipped with copious amounts of resources, information, and support aimed at ensuring students take care of their physical health, beyond basic survival. Universities can alleviate the relationship between engineering students and mental health if they prioritize mental health and advocacy just as much as physical health. Engineering school is mentally demanding, so educational institutions should invest in strengthening their students' mental health rather than primarily offering support when students are in crisis. Universities should foster discussion on the complexities of mental health, provide examples of what

good mental health can bring, and routinely offer opportunities that allow students to prioritize their overall well-being.

Ultimately, this paper aims to lay the foundation for further studies on mental health conversations among engineering students. The goal is to get students to a point where they feel comfortable asking for help and discussing mental health, recognize the importance of mental health and understand that settling for poor mental health is unacceptable. It also aims for instructors and administrators to comprehend and support students' overall well-being. Future work could more broadly, sample student definitions of mental health and aim to help students develop a more positive model of mental health.

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