

Meaningful Moments: First-year Student Perceptions of Mindfulness and Meditation in the Classroom

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Abstract

In this evidence-based practice paper, we seek to investigate our students' perceptions of the inclusion of mindfulness practices in the engineering classroom. Mindfulness and meditation involve the art and science of building an awareness of self and developing reflective techniques to promote calmness and stability. There is evidence from literature that demonstrates positive effects of mindfulness and meditation for well-being.

In engineering education in particular, the cognitive stress of engaging with the curriculum can be high. Past research has found that engineering students do perceive benefits from engaging in mindfulness activities. In engineering design, stress-management also has the potential to improve outcomes while supporting student well-being.

Although the literature around mindfulness and meditation in engineering education suggests positive outcomes for students, there is still a need for more evidence across varied contexts. In this paper, we explore student perceptions around the utility of mindfulness and meditation in a first-year engineering design course.

At a private research-intensive university in the northeast US, first-year faculty acknowledged the stress levels of post-COVID first year students and scaffolded a mindfulness and meditative program nested at the beginning of class.

We administered closed- and open-ended survey questions and used content analysis techniques to analyze the written responses from students surveyed during their first-year engineering design course. While the closed-ended responses were helpful in gaining an overall picture of our students' perceptions, the addition of an open-ended approach helped to capture students' authentic feelings about the activities in class. Results initially have been positive and in-line with the results seen in the literature, students resonating with the practices and telling us they are expecting and wanting it every day.

Introduction

At a private research-intensive university in the northeast US, first-year faculty acknowledged the stress levels of post-COVID first year students and scaffolded a mindfulness and meditative program nested at the beginning of class. Based on anecdotal evidence and preliminary review of the literature, mindfulness and meditation in the engineering classroom had the potential to equip students with complementary skill sets to the ones they build in their disciplinary coursework.

The purpose of this evidence-based practice paper is to explore student perceptions of mindfulness and meditation exercises in the first-year engineering classroom. While our preliminary review of the literature suggested the students' perceptions would be positive, the existing research predominantly investigates larger or more formalized mindfulness

interventions. In contrast, we were interested in a short, informal, but persistent inclusion of mindfulness into our everyday classroom routine that could be ‘personalized’ to each instructor such that they did not feel uncomfortable or unnatural leading their classes through these activities.

Literature Review

What is Mindfulness and Meditation?

Mindfulness and meditation involve the art and science of building an awareness of self and developing reflective techniques to promote calmness and stability. Mindfulness is developed, experienced, and studied as both a trait (a persistent and relatively stable aspect of an individual’s being) and state (a more transient quality). There exists a growing body of scientific research related to mindfulness and its impact on physical and mental health but there is also what authors Smalley and Winston describe as an “art” of mindfulness study which refers to that which can’t be captured purely by science and alludes to the rich and varied global history of mindfulness and meditation practitioners (often, but not always, with connections to religion and spirituality) [1].

Mindfulness practice is used to help the practitioner in being present. The focus first is on self-awareness and through building attention stamina, we can extend the practice to understanding and creating empathy toward others in our communities, and lastly broaden this practice to larger systems and the larger world community [2].

How is it beneficial?

There is a large field of peer reviewed work that shows that mindfulness interventions in workplace settings can improve adult mental health [3]. The non-judgmental and intentional awareness of one’s thoughts can lead to reduction of stress, improved decision making, productivity, resilience, interpersonal communication, relationships, and self-care [4]–[6].

There is also evidence from the literature that demonstrates positive effects of mindfulness and meditation for well-being specifically in college students [7]–[9]. Additionally, mindfulness in the classroom has the potential to improve relationships between instructors and students [10] as well as improve student engagement [11].

In a paper by Manak and Puig, they argue that to prepare the next generation of global solution-seekers, we must foster our students in such a way that they become engaged, motivated, and literate citizens who can work across disciplines, cultures, and identities. The traditional Science, Technology, Engineering, and Mathematics (STEM) acronym becomes three dimensional to include Stamina, Transdisciplinarity, Engagement, and Mindfulness (also STEM) so as to accelerate critical thinking of disciplinary practices across core ideas [12].

Why engineers?

Acknowledging the relationship between engineering culture, mental health, and issues with inclusion, improved interventions for retaining a diverse pool of talent have become a priority in this field [13]. For example, the engineering student experience has been recently refocused to emphasize diversity, inclusion, equity, and accessibility through initiatives from the Accreditation Board for Engineering and Technology (ABET). The reason they state is that these values are critical to “competitiveness, innovation, and our social and economic futures” [14].

To create a future where we foster a more inclusive environment, we must actively disrupt the negative aspects of engineering to promote impactful change for students. Engineering students self-report levels of stress, anxiety, and depression at a higher rate than their peers [15]–[17]; with one study confirming that engineering students were twice as likely to experience mood and anxiety disorders compared to the general college population [18]. The expectation of rigor and selectivity surrounding engineering normalizes a stress culture that can lead to feelings of exclusion [19] or exacerbate other mental health issues [20], [21].

What has been studied so far?

In engineering education, the cognitive stress of engaging with the curriculum can be high. Past research has found that engineering students do perceive benefits from engaging in mindfulness activities. In one study a majority of students participating in a mindfulness training program became more mindful which improved both their intrapersonal (focus, resilience, self-regulation) and interpersonal competencies (empathy, teamwork, communication, leadership) [22]. Stress-management in the form of mindfulness and meditation also has the potential to improve course outcomes while supporting student well-being. For example, research shows that long-term meditation can increase divergent thinking, a form of creativity used in problem solving [23], [24].

Most recently, the COVID-19 pandemic exacerbated stress levels in college students [25] leading some educators to seek alternative teaching practices to help students focus. One study found that students perceived a benefit to short mindfulness activities at the end of class sessions and appreciation of the instructor’s acknowledgement of their mental health needs [26]. In a mind-body physical activity (MBPA) intervention during the COVID-19 pandemic students practiced various breathing, meditation, and physical activities to alleviate stress. Students reported that the intervention affected their well-being making them feel “*more grounded and focused.*” They also reported a desire to “*implement the intervention techniques post-study to increase well-being*” and their appreciation of being part of the study which “*lowered the stress of being in college during the pandemic*” [27].

Although the literature around mindfulness and meditation in engineering education suggests positive outcomes for students, there is still a need for more evidence across varied contexts. In this paper, we explore student perceptions around the utility of mindfulness and meditation in a first-year engineering design course.

Methodology

Researcher Role

We, the authors, are full-time non-Tenure track teaching faculty in the College of Engineering. Each instructor teaches between one and three sections of an introductory class for first year engineering students. The class is project-based and covers an introduction to the engineering design process and several basic engineering tools (code, CAD, microcontrollers). The class is required for all engineering students regardless of major, including those who are undecided.

Each of the authors includes mindfulness exercises in some way in their classroom. This practice began in our group several years ago as a response to perceived student stress levels (which appear to have only been exacerbated by the COVID-19 pandemic). We are not formally trained mindfulness educators. We communicate to our students upfront that we are not intending to position ourselves as experts in this field but instead as fellow practitioners who are interested in whether mindfulness techniques might be beneficial to them in addition to ourselves as instructors.

Table 1 summarizes the different ways we have each incorporated mindfulness-based activities into our classrooms. Again, our approach at this point is informal. We are not adhering to any formalized mindfulness program, instead taking very general inspiration from existing literature [1] and our peers and creating ad-hoc classroom activities that are responsive to our students' immediate needs and feel authentic for us to deliver. Please see Appendix B for definitions and a basic description of the activities, as well as resources used.

Table 1. Summary of Mindfulness Delivery by Instructor

Instructor	Average Duration	Occurrence	Short Description
Instructor A	1 minutes	Daily	Breathing exercises, body scan, gratitude activities
Instructor B	30 seconds	Daily	Breathing exercise coupled with a theme like gratitude or intention-setting
Instructor C	10 - 30 minutes	Bi-Weekly	Box breathing, active listening activities (2), gratitude activities (2), body scan
Instructor D	2-3 minutes daily, some 10-30 minute activities	Daily	Box breathing, active listening activities, gratitude activities, body scan, themed exercises

The mindfulness activities undertaken vary across the study group but consist of some of the most common, fundamental exercises found in mindfulness practice like box breathing, gratitude

meditations, and body scans. We have, to-date, not enforced a uniform approach to these activities because we have found instructors' comfort levels with certain activities (e.g. body-scan) vary and initially contend that the most successful activities for students will be those that feel most authentic to the instructor leading them. Administering the same survey to all students as part of this study may provide some insight into whether the type or frequency of mindfulness activity influences our students' perceptions of their benefit.

Survey Data Collection

At this stage, we chose an open-ended approach to capture students' authentic feelings about the activities in class. In this study, we used content analysis techniques to analyze the written responses from students surveyed at the end of their first-year engineering design course in the Fall 2022 semester. Participation in this survey was optional and students were not required to complete all questions. This study was IRB exempt at the University.

The survey questions, as written, arose organically from our individual curiosity around how our students were receiving our mindfulness efforts in the classroom. If the findings of this preliminary work support further investigation, we will look to the literature for more established evaluation tools. This survey was intended to investigate the following questions:

- How do students feel about completing mindfulness exercises in class?
- Do students wish we spent more or less class time on these exercises?
- Do students feel that these mindfulness exercises help them focus, reduce anxiety, change gears between classes, or something else?

The full text of the survey questions and response options can be found in the appendix.

There was a total of 208 responses to the survey. Table 2 displays how the responses breakdown across each of the instructors. Demographic information for students was not collected, however, available data for the first-year program indicates 48.1% female, 16.0% underrepresented minority, and 4.8% international students.

Table 2. Response Breakdown Across Instructors

Instructor	# of Respondents	Total # of Students	Response Rate
Instructor A	79	79	100.00
Instructor B	71	90	78.89
Instructor C	17	25	68.00
Instructor D	41	44	93.18

Data Analysis

The goal for data analysis for this evidence-based practice paper was to be able to inform our future practice and share our results with the broader discourse community around mindfulness and meditation by connecting to related literature. Given the informality in the manner in which this data was collected, for the closed-ended survey responses, we looked at major trends in responses and did not conduct in-depth analyses. For the open-ended questions, we used content analysis techniques from White & Marsh [28] including iterative coding to look for patterns in the data. In coding the data, we used a combination of semantic and latent methods (i.e., coding explicit words and also coding for subtext). These provided new insights and also corroborated our closed-ended data.

Findings and Discussion

Closed-ended survey questions

There appears to be strong agreement that students enjoyed having mindfulness exercises in their engineering classroom. Nearly 85% of respondents report liking or loving the mindfulness exercises. No students reported hating them, with approximately 5% reporting not caring about them. A pie graph depicting the full results of our survey question is presented in Figure 1.

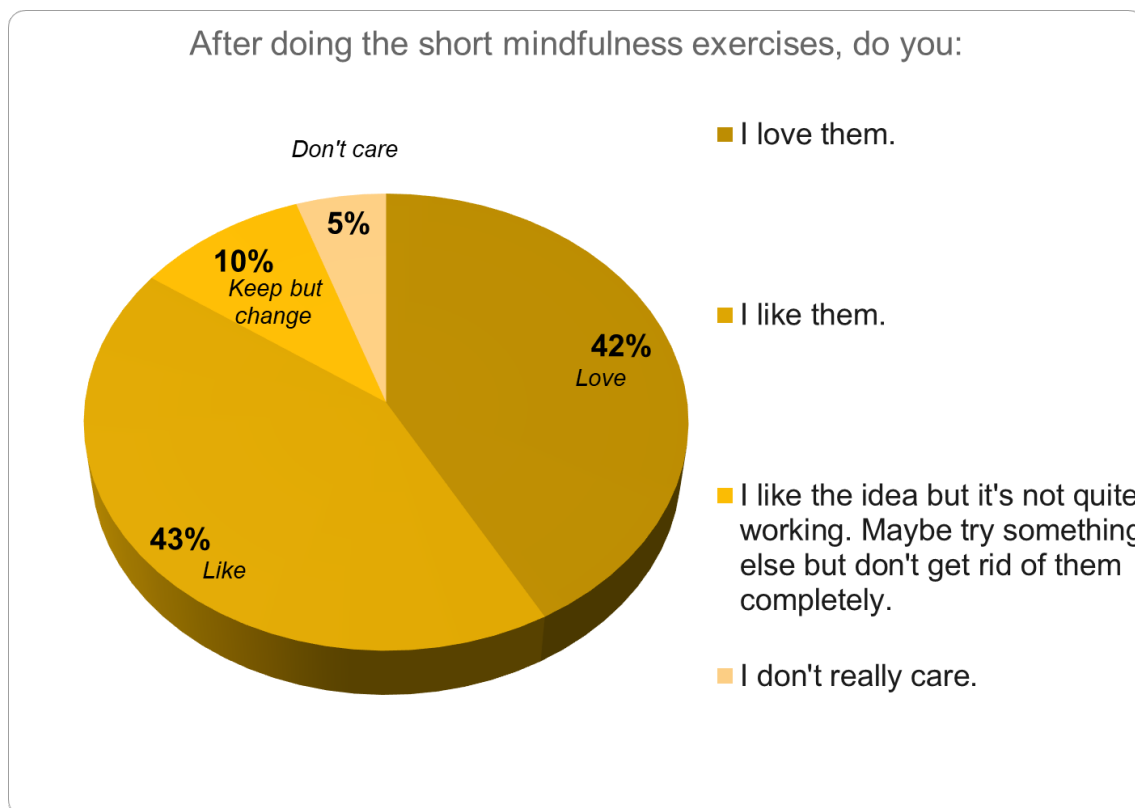


Figure 1. Engineering students' feelings towards mindfulness in the classroom

It also appears that students are satisfied with the amount of time that their instructors have chosen to spend on these topics. A majority of students (~73%) felt the amount of class time dedicated to these exercises was good. Of the smaller group of students dissatisfied with the amount of time spent on mindfulness activities, most wanted more time spent on them - not less (50 out of 57 responses). A pie chart of the full results of our survey question is presented in Figure 2.

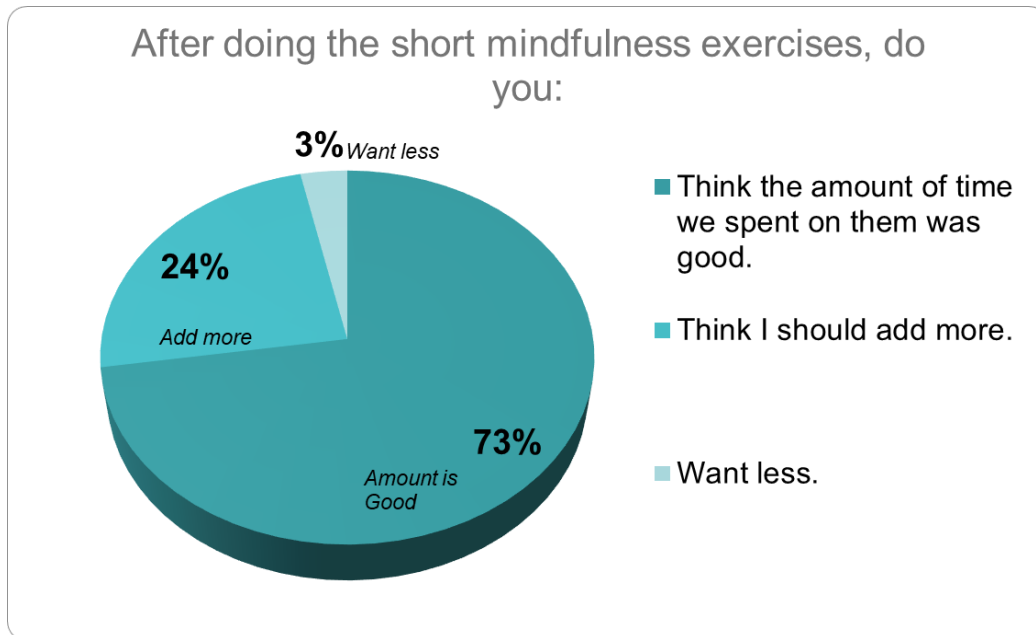


Figure 2. Students' opinions on the timing of mindfulness in the classroom

Approximately 60% of respondents said that the mindfulness exercises helped them to focus, and nearly half felt that the exercises helped them change gears between classes. Only 4% of respondents reported perceiving no benefit from the exercises. A bar graph of the full results of our survey question is presented in Figure 3.

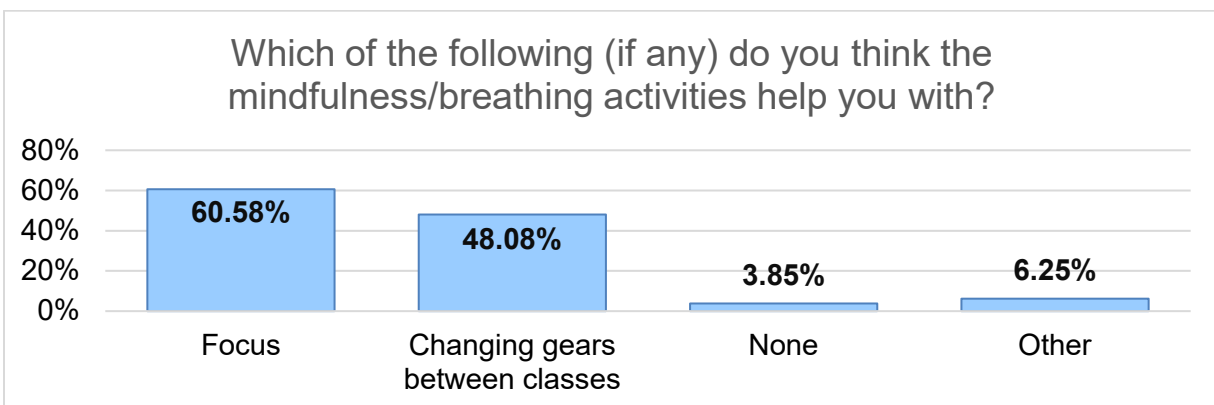


Figure 3. Students' opinions of the benefits of mindfulness activities

Open-ended survey question

Qualitative content analysis techniques [28] were used to explore the open-ended responses to the survey. Students were asked: Overall, how do you feel about the mindfulness/meditation exercises we've done this year? If you found these exercises helpful, can you describe a particular example?

Unsurprisingly, a majority of the open-ended responses expanded on the closed-ended prompts provided such as focusing, de-stressing, and changing gears before class as well as timing of the exercises. For example, one student wrote these exercises “allowed me to collect myself, be present, and slow my brain down and prepare for the class.” Still, we found patterns of specific feedback worth discussing. This is not an exhaustive presentation of findings, but rather represents the most significant results based on the literature and our professional experience.

Impact beyond the classroom

Many students noted that they do breathing exercises outside of class. For instance, a student said, “I now incorporate exercises such as box breathing and expressing gratitude in my daily life.” This makes sense as engaging in mental healthcare has become less taboo, especially among Generation Z [29]. This is especially noteworthy in a STEM setting which has historically sidelined these issues for the most vulnerable [30]. Students may also be beginning to recognize the implicit and explicit connections we make between self-care and being a competent STEM professional. One student notes the need for this in STEM courses and another says explicitly that these mindfulness and meditation exercises helped them get into an “engineering mindset.”

Negative comments and their implications

While it should be stressed that the vast majority of responses were positive, there was neutral and negative feedback worth noting. For example, a few students felt the breathing exercises stressed them out more or that they were hard to do. It was also mentioned twice in responses that these activities were a waste of class time. Anecdotally, this is a common fear for practitioners considering using mindfulness techniques in the classroom, but it’s important to note that these responses were in the extreme minority. Overall, the negative comments were few and far between and do not represent the majority of student responses. Still, it suggests that it is important to make these exercises voluntary in class. Even if students felt neutral about the activity, they often still liked the moment of calm to be set aside in class. For example, several students wrote things like, “I personally don't usually do mindfulness/meditation since it doesn't really work for me but I like having it in class because it provides time to prepare and settle down before class” or otherwise expressed the sentiment that the exercises were good to have but not for them personally. In this particular example, the student says it doesn’t work for them but then says it gives them time to “prepare and settle down before class.” This highlights the importance of explaining more than once what mindfulness and meditation actually is and what impact we can expect, because it could be argued that this student is actually experiencing

benefits they have not yet built awareness of. Instructors can also suggest alternative activities to students such as cloud gazing or coloring [31].

Specific activities students enjoyed

Lastly, many students took the time in the responses to emphasize particular activities that resonated with them. These included things like the box breathing exercises and gratitude-related activities. Gratitude in particular was mentioned frequently in the open-ended responses. For example, a student wrote, “this mindset change of being grateful for the positive things in my life helped me deflect from the chaos and stress of assignment/project heavy week.”

Limitations

The evaluation of our teaching practice presented in this paper has several limitations. Because the survey questions were developed a-theoretically, we are limited in the conclusions we can draw. This is partially mitigated by the literature-informed approach we took to designing the evaluation. One strength of the work introduces a related weakness and that is, multiple instructors implemented these exercises in their classroom with classroom instruction and specific implementations of the mindfulness and meditation exercises varied. We sought to reduce the impact of this by involving multiple research-practitioners in the coding process. Lastly, although students knew these responses were anonymous, with questions like these there is risk of response bias in which students answer with responses they feel are more socially acceptable or agreeable [31].

Our Top 5 Recommendations for Educators

Based on our experience in the classroom and the analysis of the survey responses, the following are 5 suggestions for educators seeking to implement mindfulness and meditation in the classroom.

1. **A Little Goes a Long Way:** Find small ways to incorporate mindfulness into your classroom that you feel comfortable participating in with your students.
2. **Situate Yourself as Co-learner and Co-practitioner:** Don't worry about not being an expert or not having formal training.
3. **Emphasize Benefits:** Communicate to students that you're doing this because you think it will benefit them. Consider sharing ways you have benefitted from the practice if such benefits exist.
4. **Continuous Feedback:** Check-in with your students throughout the term to see if the exercises are helpful to them (e.g., in a mid-semester anonymous survey).
5. **Mix it Up!** Students may appreciate some time spent on a specific theme or intention like gratitude or body scan meditation to guide their practice.

Conclusion

We surveyed 238 students regarding their perceptions of the mindfulness-related activities we had added to our classroom. We received 208 responses. Our findings support the findings of existing literature that the inclusion of these exercises is perceived as beneficial by engineering students.

A strong majority of the students surveyed had positive perceptions of including mindfulness practices into the engineering classroom. Few students (4% of respondents) report perceiving no benefit from the mindfulness activities. The majority of responding students report that these exercises help them to focus, and the open-ended survey results reinforce the findings from the closed-ended questions while also suggesting that students may be utilizing these strategies outside of the classroom as well.

Our findings suggest that formal mindfulness training is not required for instructors to lead activities that students perceive as beneficial in some way. (Without formal training, we have explicitly positioned ourselves with our students as co-practitioners.) Additionally, the mindfulness activities included in the classroom do not need to be long or take up significant class time for students to appreciate them. As little as 30 seconds, if done consistently, appears to provide some value to engineering students.

Educators may be hesitant to carve out time for mindfulness or meditation but practicing the art of attention builds executive functioning and helps students focus on the task at hand. The time spent on these practices need not be seen as another lesson to squeeze into a packed curriculum, but instead, short practice sessions are a way of helping students emotionally regulate and become fully present. We contend that carving out time for mindfulness in our curriculum in small ways is a simple, but potentially powerful, addition to create the next generation of engineering thinkers. With these ongoing interventions, we seek to develop resilient lifelong learners.

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Appendix A – Survey Questions

1. After doing the short mindfulness exercises, do you:
 - a. I love them.
 - b. I like them.
 - c. I like the idea but it's not quite working. Maybe try something else but don't get rid of them completely.
 - d. I don't really care.
 - e. I hate them.
2. After doing short mindfulness exercises do you:
 - a. Think the amount of time we spent on them was good.
 - b. Think I should add more.
 - c. Want less.
3. Which of the following (if any) do you think the mindfulness/breathing activities help you with?
 - a. Focus
 - b. Changing gears between classes
 - c. De-stressing/reducing anxiety
 - d. None
 - e. Other (free response)
4. Overall, how do you feel about the mindfulness/meditation exercises we've done this year? If you found these exercises helpful, can you describe a particular example?

Appendix B – Definitions and Resources

Here are some resources we have come across and have found helpful. (Note: We do not seek to endorse any particular program.)

Technique	Definition	Resources
Active Listening	A listening technique that gives full attention to a speaker without interruption	https://www.berkeleywellbeing.com/active-listening.html
Box Breathing	Simple breathing style to help lower stress utilized by US Navy Seals.	https://health.clevelandclinic.org/box-breathing-benefits/
Body Scanning	An awareness technique that focuses on sensations in the body in a gradual succession from the toes to the head.	https://www.uclahealth.org/programs/marc/free-guided-meditations/guided-meditations#english
Gratitude	Various activities that focus on gratefulness and being thankful. This can be a focus during meditation and breathing. It can also be keeping a thankfulness journal. Class activities can be having students report out things they are grateful for.	https://ggia.berkeley.edu/practice/gratitude_meditation
Intention Setting	Stating what experiences, feelings, or actions you wish to focus on or achieve	https://medicine.utah.edu/gme/wellness/pausing-practices/setting-an-intention