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Student and Instructor Reflections on Integrating Short Mindfulness-Based Meditation Practices into a First-Year Engineering Design Course

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Full Paper: Student and Instructor Reflections on Integrating Short Mindfulness-Based Meditation Practices into a First-Year Engineering Design Course

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Abstract

Engineering students in the United States are experiencing substantial stress and threats to their well-being. Mindfulness-based meditation practice may help students to better manage these challenges as mindfulness-based interventions have been found to improve college students' well-being and critical competencies. However, only limited mindfulness-based research has been conducted with the engineering student population. This work integrated short mindfulness-based meditations into a first-year engineering design course to explore how these practices affect engineering students. To understand students' perceptions of these practices, written reflections were collected, and follow-up interviews were conducted. Generally, students perceived these in-class practices positively and described improved stress management, being more self-aware, and improvements in learning and coursework. The authors also share their insights on implementing these practices into their courses. We discuss challenges associated with engagement, the timing of the practices, and logistical issues. Overall, the results of this work encourage the integration of mindfulness-based practices into introductory engineering courses as students perceive many benefits. However, it is simultaneously necessary to recognize that implementing these practices can be challenging for instructors. Future research should investigate the effects of implementing these practices in other types of engineering courses like a first-year seminar course.

Introduction

College students in the United States are reporting increased stress [1], likely due to greater educational and environmental stressors [2]. This additional stress is compounding the significant stress already experienced by engineering students [3]. Furthermore, students' well-being has been found to drop significantly during the first year of college and while it does rebound by the end of the year, it does not return to pre-college levels [4]. Therefore, engineering students are struggling with a considerable amount of stress, which is likely to adversely impact their well-being. Prior work has concluded that mindfulness-based interventions can reduce college students' stress and improve their well-being [5], [6]. However, there has only been limited research conducted with the engineering student population. Incorporating mindfulness-based meditation practices into first-year engineering courses has the potential to enrich the development of engineering student well-being and help institutions cultivate more holistically sound engineers.

In academic disciplines outside of engineering, mindfulness-based interventions consisting of multiple or repeated sessions have been found to reduce college students' stress and anxiety [5] and improve their mood [7]. Additional interventions have been shown to help students transition to college [8] and improve students' perceived learning [9]. In engineering, it has been found that non-cognitive competencies like mindfulness can be developed [10]. Moreover, first-year engineering students are receptive to short mindfulness-based interventions [11], [12] and another mindfulness intervention for first-year engineering students was shown to improve students' intrapersonal and interpersonal skills [6]. Integrating mindfulness-based practices into first-year engineering courses is likely to benefit students in many ways.

In this work, brief mindfulness-based meditation practices were incorporated into a required first-year engineering design course. This paper will detail students' perceptions on including these practices into their course and the authors will share their insights on incorporating these practices into the course.

Methods

Brief mindfulness-based meditation practices were incorporated into multiple sections of a required first-year engineering design course at a large mid-Atlantic university as part of two larger institutional review board approved research studies. Each meditation practice was formatted as a guided seated meditation with the narrator being alternated between a male and a female voice. All meditations were from a validated meditation program [13], [14] and played aloud in-class. Students got to experience a mixture of focused attention, open awareness, and loving kindness meditations. Students who consented to the use of their data for this research were ~18 years old, 5 women and 10 men, 11 white and 4 another minoritized race, and all had varying amounts of previous experience with mindfulness-based practices.

During Study 1 (S1), the course was being administered online due to restrictions relating to the global COVID-19 pandemic. This course occurred during the summer semester and met every weekday for seven weeks. Students in this course participated in onr meditation every day at the beginning of class. Halfway through the course, students were asked to submit a one-page written reflection describing how they perceived these in-class meditations. During Study 2 (S2), the course was administered in-person and students met three times a week for fifteen weeks. Students participated in 1-2 mindfulness-based meditations a week for the first eight weeks of the semester. The timing of the practices varied from beginning, middle, and end of the class session depending on the course content for the day. A subset of the students from this study were interviewed about their experience with the practices during week eight of the semester. For both the written reflections and the interviews, students were asked about their perceptions of the practices (e.g., positive/negative aspects), how the practices impacted their education, and how they would change the practices.

Interview transcripts and reflections were analyzed using directed content analysis [15] following a multilayer approach to quality and care throughout the qualitative research process [16]. Though the coding of the transcripts was only conducted by the first author, the codebook was developed in collaboration and iterated multiple times. The codebook for this analysis was developed by identifying key concepts in a subset of the documents and creating operational

definitions for a set of proposed codes based on key concepts, theory, and relevant literature findings. The codebook was refined until consensus was reached by all collaborators. Instructor reflections are the personal experiences and opinions of the authors of this paper.

Results and Discussion

Student Reflections

All of the students that participated in this research (S1 = 3, S2 = 12) reported enjoying participating in these practices or finding them helpful. In the interviews and reflections, students described (1) improved stress-management, (2) being more self-aware, (3) improvements in learning and coursework, and (4) some negatives to completing the meditations in-class.

All students (N =15) reported that completing the in-class mindfulness-based meditations helped them with their stress management. Students often detailed how the mediations helped them to relax, be calmer, and reduce their perceived stress. Students discussed how the practices helped them reduce the stress they experience in-class, as well as the external stress they experienced as first-year engineering students. For example, one student discussed how the in-class practices helped them manage many sources of stress:

> *"… There's so many things that can put you under stress, so many things racing in your mind at times being a college student that you can use these practices, just to calm yourself down, reflect on your thoughts, and help you move forward in life."*

Students also reported being more self-aware after participating in these practices (N = 8). Students described being more aware of how they were feeling and the feelings they were carrying with them throughout the day. Some students also discussed how this awareness helped them to process and be more accepting of their emotions. This student described how participating in these practices helped them notice their emotions and move forward:

> *"[The in-class practices were] a good chance to accept what's going on in your head. It's definitely been one of the things that's been really nice to sit there, and look at myself and be like "Okay, I addressed the fact that I'm really stressed about this thing. I understand that this is something that made me upset, it's okay for me to feel those emotions, but it's time to accept them, work through them, and move on, because if not I'm just going to have that emotion going with me the whole day."."*

A subset of the students also expressed a perceived improvement to their learning and coursework (N = 8). These students explained that the practices helped them to focus better on class and their homework, which helped them to retain more knowledge and complete their coursework. Most students discussed how these practices helped them with their engineering design course like this student who described how improved focus helped them in class:

> *"Getting to listen to these meditations helps me a lot during class. It mostly helps me to get focused on my new class and to forget about the assignments I need to complete for my other class. I am able to be present on the tasks that I need to complete for [the engineering design course], which is very helpful for me. It helps me to not procrastinate on anything, which is a habit I usually have."*

Lastly, students reported some negatives to completing these in-class meditations (N = 6) but perceived these negatives to be fairly minor. Negatives to these practices included not being fully focused on the practice because students have to finish coursework by the end of class time, boredom if you choose not to participate in the practice (students were not provided an alternative activity but could choose not to participate), and wanting to leave class instead of doing the meditation at the end of class. Still, students agreed that they would like to continue to do these practices despite the negatives. When students were asked how they would change these practices if they were to do them in a class in the future, there was little consensus on how these practices should be changed for other classes. Students disagreed on whether these practices were best if completed at the beginning, middle, or end of the class. However, students would prefer the time to be consistent and a few students stated that the practices did not need to be completed every class day. Many students, including all of the students in Study 1, also said it would be nice if they could occasionally do longer meditation practices. Lastly, some students requested practices with more movement like stretching or yoga.

Overall, these results suggest that students were receptive to completing the mindfulness-based meditation in-class and they perceived many benefits. This aligns with prior research that found that students are receptive to mindfulness-based interventions [6], [11], they perceive increases to their interpersonal competencies [6], and they experience reduced stress [5], [6]. Additionally, these findings may also align with previous research, which found that mindfulness-based interventions can help first-year students transition to college [8].

Instructor Reflections

Author 2 (S1) implemented the mindfulness-based meditations at the beginning of every online class session. This class met every weekday. Author 3 (S2) included 1-2 meditation sessions a week during the in-person class sessions for the first half of the semester (~8 weeks). This course section met three times a week. Both instructors were implementing these practices into their course for the first time.

One of the more prevalent challenges was gauging students' engagement with the practices. During both studies, all students were strongly encouraged to participate but were not forced to do so. Both instructors indicated that it was difficult to measure how engaged students were due to the cognitive and individualistic nature of the practices. The instructors also noted that engagement could fluctuate depending on the mood of the class that day. Engagement was especially difficult to evaluate when administering the practices online as many students did not use webcams. In-person students appeared to be better engaged with the practices, likely because of the direct supervision and participation of the instructor. It was also noticed by Author 3 that students grew to enjoy the practices more over time. Overall, both instructors agreed that the engagement of students with these practices is likely better in an in-person course setting.

While Author 2 always implemented the meditations at the beginning of the course session, Author 3 changed the timing of the practices to either be at the beginning, middle, or end of the class. Author 2 noted that while having the practice at the beginning of class was intended to help students orient and prepare for the class, it often delayed the start of class because the instructor needed to wait for students to log into the online class before starting the practice.

Author 3 noted that being able to move the time of the mediation to better fit in the course material for the day was advantageous. Additionally, Author 3 noticed that different class sections had different preferences. For example, Author 3's morning class section liked having the practice early during class (e.g., at the beginning), while the afternoon class section liked the practices later in the class session, especially on Friday (e.g., at the end of class). Lastly, it is of note that Author 2 thought a five-minute practice might be too long for an online course, especially when done daily, but the same duration worked well for the in-person course, according to Author 3. Generally, our instructors recommend working with the students to find a schedule that works best for each class section.

Lastly, there were some logistical issues with implementing these practices into the course. Firstly, our instructors recommend testing the required technology before implementing the practices to make sure that all students can hear and participate in the practice. They also advise planning your practice schedule in advance. Following these tips will help instructors to be more prepared for the practices and to have the best use of their instructional time.

When asked if they would implement these practices in their courses again, our instructors agreed that they would likely implement them again in an in-person course but would hesitate to implement them in an online course. Also, no differences were noticed according to the type of meditation practice (e.g., focused attention versus loving kindness). Therefore, they would likely keep a variety of practices to introduce students to various options. Lastly, our instructors would prefer to implement 1-2 practices a week rather than daily practices. A complete recommendation for implementing daily mindfulness-based meditations into a first-year engineering course based on the insights from this research can be seen in Table 1.

Table 1. Recommended Best Practices Based on the Results of this Research

Issue	Recommendation
Purpose	Students appreciated participating in these practices and perceived benefits to their stress management, self-awareness, and learning and coursework. Instructors perceived the practices to facilitate transitions into instruction and increase student engagement.
Practices	This work utilized guided seated meditations [14]. Instructors should include a variety of practices to introduce students to many types. Students also requested a few mindfulness-based practices with more movement like stretching and yoga.
Timing	Each class section is likely to have preferences on when during the class session they would like to do the practice. Instructors should work with the class to find the best schedule. Instructors should also consider the course content for each day and plan practices in advance.
Duration	Guided seated meditations of 3-5 minutes 1-2 times a week are likely to work well for first-year engineering courses. Students also requested a few longer practices be included when possible.
Logistics	Test the required technology before implementing these practices in-class to ensure the best practice experience for the students and the most efficient use of instructional time.
Engagement	Regularly encourage students to participate in the practices but do not force students. Also, urge students to reflect on their practice and how it has changed throughout the course.

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