

WIP: Contemplative Practices' Effects on Compassion, Belonging, and Self-Empowerment in Undergraduate Engineering Experiences

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Abstract—This Work-in-Progress Research Paper examines the use of contemplative pedagogy for cultivating empathetic and compassionate learning environments in engineering education. Contemplation – often associated with heightened awareness and presence of mind – is comprised of such practices as deep listening, beholding, and meditation, which engage participants in intentional reflection, consideration, and thoughtful observation. Contemplative pedagogy supports participants, individually and collectively, in engaging deeply with themselves and the world by emphasizing empathy, compassion, self-compassion, and creativity. Traditional engineering education engages students predominantly in cognitive ways of knowing. In comparison, contemplative pedagogy creates learning environments that transcend cognition, thereby infusing emotional and embodied knowing into the educational paradigm. Such learning spaces can empower students to access their whole selves in their educational journeys and foster empathy, compassion, self-compassion, and ultimately, belonging to the learning process and learning environment. This paper describes two participants' journeys in one undergraduate physics foundation course delivered at a small, private, non-traditional, engineering college, where students were invited to engage with course content through contemplative pedagogy, including approximately weekly reflective assignments. Each assignment invited students to engage with meditation, curated contemplative activities, and contemplative readings in addition to the technical content. Two of the eighteen students enrolled both consented to participate in the study and engaged with every reflective assignment. Participants' data were analyzed as an instrumental case study using narrative and thematic approaches to allow for emergent phenomena to surface. We find that contemplative pedagogy offers students a scaffolding to reflect on themselves, the world, and the relationship between the two. As well the transformative power of contemplative pedagogy is affected by the participant's focus and orientation toward contemplative practices: one student focused on internal growth and experienced feelings of empowerment through improved connection with themselves; another student focused on facilitating growth in others and did not perceive transformational changes.

Index Terms—*contemplative pedagogy, compassion, belonging*

I. INTRODUCTION AND LITERATURE REVIEW

In higher education, STEM disciplines are marred by complex socio-educational contexts [1]. Students coming from educational environments grounded in quantitative analysis and critical thinking must navigate more nuanced learning

spaces while relying on external measures of selfhood. These contexts divorce personal experiences and identity from the learning process in the pursuit of a rigid objective truth through critical and technical analysis [2]. Contemplative pedagogy as an emerging set of innovative practices, particularly in engineering education, embraces the cultivation of personal and collective senses of belonging by encouraging participation of students' truest and most authentic selves in their personal and collective learning processes [3]. By celebrating and leveraging all students' diverse ways of knowing and being, contemplative pedagogy can foster the development and maintenance of meaningful interpersonal relationships, as well as build a sense of community [4]. This is usually done by engaging first-person narratives in learning processes that allow for "ownership" of the learning process and authorship of one's learning trajectory based on contemplative reflective practice about oneself as a learner [5]. Contemplative pedagogy offers a method for the "integrat[ion of students'] own rich experiences into their learning" [6] and supports them in elucidating meaning and related connections with oneself, one's peers, the systems, and world in which they find themselves. Despite its benefits, there is little literature that discusses the use of contemplative pedagogy in STEM and even less so in engineering education. The most notable close source relevant to this space is Donald Schön's work on reflective practice [7] and other relevant literature on the value of reflection in engineering education (e.g., [8]-[12]). However, analytical reflective processes, such as Schön's reflection-on-, reflection-in- and later added reflection-for-action, as well as those of reflection, reflexivity, and critical reflection currently practiced in engineering education, differ from contemplative reflection in important ways. The contemplative way of reflecting allows for quieting one's mind to support the creation of moments of non-judgemental awareness and non-judgemental acceptance. Furthermore, contemplative reflection leverages multiple practices – beyond those of writing – to engage different ways of being and knowing aligned with different students' selfhoods (e.g., [3][4][13]-[18]). The Tree of Contemplative Practices describes a selection of practices engaged in contemplative

work. These practices hone and support the hard work of reflection allowing for the slowing down necessary for non-judgement, awareness, and acceptance to come into focus for effective reflection to take place (e.g., [19]). In this Work-In-Progress Research Paper, we bridge contemplative practices – specifically, contemplative reflection – with engineering education by analyzing the reflections of two undergraduate engineering students in a physics foundation course which leveraged contemplative pedagogy. This work is of particular importance as, in engineering education today, there is a dearth of learning environments that cultivate compassion, especially self-compassion, and holistically engage students and their diverse ways of being, including their emotional selfhoods.

II. METHODS

The course from which the data were collected was delivered at a small, private engineering-only college that departs from the traditional engineering education paradigm throughout its curriculum. Contemplative pedagogy was leveraged in one of the two required undergraduate Physics foundation courses offered in fall 2019. Eighteen students (8 woman-identifying, 7 man-identifying, and 3 gender-fluid; 5 BIPOC), ranging from sophomores to seniors, enrolled. During the first half of the course, students were invited to engage in activities intended to expose them to a range of contemplative practices. In the second half, students worked on self-directed projects to explore contemplative practices in domains of their choice leveraging full cognitive autonomy [20]. Students were invited to engage with 10 reflective assignments that were distributed approximately weekly. The students were encouraged to engage with each assignment as much as they could with an opportunity to personalize each assignment in whole or in part. Each assignment included a guided meditation as well as curated contemplative activities and readings based on the preceding classes. To allow for deeper introspection and more authentic engagement with their reflective practice, the instructors removed graded assessment with the hope of supporting shifts in students’ intrinsic motivations, as defined by the Self-Determination Theory of motivation [21]. Specifically, between the sixth and seventh assignments, the students were informed that those passing the course would earn a grade of an ‘A’ with continued effort and engagement in the learning process. Of the eighteen students enrolled, eight consented to participate in our study. Of them, only two accepted the invitation to engage with every assignment. It was for this reason that their assignments were chosen for the study. Prior to analyses, students’ reflective assignments were scrubbed for any identifying factors and pseudonymized. Sasha, a third-semester Electrical/Computing Engineering student, self-identified as gender-fluid. Regina, a fifth-semester Mechanical Engineering student, self-identified as a woman. Although we began this investigation as a multi-case study to allow for comparisons between developmental journeys of each participant, our process evolved into instrumental case study as new emerging critical phenomena were found in each student’s trajectory [22]-[25]. A mix of narrative and thematic analysis

approaches were used within and across each case [22][26]. Two scholars – a senior Engineering major concentrating in education, transgender woman, with several semesters of experience as a teacher and as a learner of contemplative practices; and a junior majoring in Mechanical Engineering, nonbinary person, unfamiliar with contemplative pedagogy prior to engagement in this study – read for emergent ideas broadly relating to motivation and emotion, guided by the following research questions: (a) How did students engage with contemplative practices in the context of this course? (b) How was students’ engagement with the course impacted by their prior experiences with contemplative practices? and (c) What were the outcomes of students’ engagement with the course? Analysis began with narrative memos, written individually by the two scholars, followed by comparative memos, written jointly by both scholars and further discussed among all four co-authors to allow for emergent theme refinement and the identification of three themes presented in the three subsections below.

III. RESULTS AND DISCUSSION

A. (Dis)-connections with emotion

Both Sasha and Regina express desires to be more conscious of their emotions; however, they differ in how they do so. Specifically, the first assignment invited students to situate their engagement with the course in relationship to the course goals and objectives and to set individualized learning goals and objectives. In response to this invitation Sasha shares:

Most of my work thus far has been in traditional engineering spaces where any sort of liberal arts tend to be looked down upon or just not used... I hope that I can... work on my internal biases against non-engineering topics such that I can better include [them] in my work. I do value them, but I am undoing years of conditioning in overly masculine STEM spaces...

Sasha continues to explain that these are places where technical experience “has been solely based in theory and ha[s] almost no tie back to the human experience and ethics.” Sasha feels that their experiences in these spaces instilled a technical mindset and a cognitive lens that focused on facts and logic. In their second submission, after a meditation on sound activity, Sasha reflects on how they listen:

Doing these deep listening activities helps me realize how little I actually listen with the intent to listen. I am always listening with an alternative motive: to be able to talk, respond, to analyze, to interpret, etc. ... If I need to analyze, I need to truly listen before I can properly analyze. But other times, I should simply listen for listening sake.

These excerpts capture an analytical approach to emotions that characterizes Sasha’s early assignments. When asked to reflect on how they feel, they use only a few words indicating a depth in their emotional capacities but they quickly shift to analyzing their responses and explaining them out, i.e., “cognitivizing” their emotions without explicitly “sitting with”

them. They identify behaviors they want to change but rather than centering the underlying emotions, they state the way they “hope” to change. For example, in their first submission, Sasha shares:

I spend most of my time going and very little time stopping to reflect... I have tried numerous times to journal, but I last a week or so at best... I need to reinstate the value of deeper self-awareness and reflection... It will reduce my stress levels and help me to think clearer, making me more effective at tackling problems.

Over time, Sasha begins to express greater comfort with contemplative practices and hinting at their emotions with fewer invitations to do so. In their sixth assignment, Sasha shares:

Contemplative practice means it is okay to sit with things that are unknown. It means it is okay to [take] things slowly and let them sink in: there is no rush. Focusing on the thinking and not the doing; isolating oneself from the noise. I can use contemplative practice to slow down my thought process. I can use it to isolate myself from my worries. I can take internal struggles and move them elsewhere...

Sasha focuses on what they can achieve through the use of contemplative practices. It helps them to shift their thoughts away from what was or what could be. They use contemplative practices to analyze their emotions, “the thinking and not the doing” in these middle-of-semester assignments, separating their thought processes from their emotions and allowing both to be present.

Regina, on the other hand, expresses confidence in her ability to connect with her emotions. Through contemplation focused on beholding of her feet in the third reflection, she recalls fond memories from her past. Regina then discursively disengages from her present difficulties and escapes into those memories, “I am going through a very hard time right now and my feet tie me back to times that bring me pure joy...”

In Regina’s fourth reflection, after a beholding activity focused on an apple, she again engages in discursive disconnection from the present by imagining a potential future:

I am excited at the way these apples are opening so many possibilities, all the things I could cook with them. I feel energized by the possibilities ... they are all great.

Interestingly, Regina rarely uses contemplative practices to connect with her present-moment emotions. In this way, contemplative practices serve not to sit with her current state; they are a way for her to dissociate from the present-moment.

B. Sasha’s emerging self-empowerment

Sasha’s experiences connecting with emotions in an academic space, however subtly or through more cognitive means, give rise to feelings of self-empowerment. In turn, this newly emerging sense of self leads to a newly emerging relationship with the world. In their first submission, Sasha sees themselves as lacking experience grappling with their emotions:

I think a deeper capacity for self-awareness and reflection is extremely important. It will reduce my stress... and help me think clearer, making me more effective at tackling problems.

In their ninth submission, Sasha shares how their experiences with gender-identity based harassment made it so that

...the education system, for the first time ever, was not a point of safety. The traditional STEM courses I was taking at the time felt cold and lifeless.

They no longer felt supported in these STEM spaces, in which they were once comfortable and confident. In comparison, Sasha reflects that this course became a STEM space in which they and their new self, felt supported and empowered:

This class has created an environment where we can learn the skills which have been lacking for our whole lives... I am still not over my trauma by any means, but now I have more of the skills to be able to live my life again.

In these later reflections, Sasha shares their emotions without the need for analysis and writes with a more assertive voice. Sasha reflects on learning that was lacking in their previous education, and advocates for the implementation of contemplative practices in STEM education. They see empathy, resilience, and emotional intelligence as “integral to STEM.” With their final project, Sasha feels empowered to look inward, sit with their feelings, and focus on “[their] own gender and queer resilience: processing [their] own thoughts in a contemplative manner.” They no longer “hope” that they can make the progress they desire; they actualize their goals. In their final reflection, Sasha shares:

The skills taught in this class molded my view on engineering... I am now reminding myself to slow down, and take a step back to reflect... This helps maintain a strong mental health, but it also helps with the outcome of technical projects. When working on projects in a constant go-go-go mode, it is easy to forget how it affects people... This leads to the perpetuation of sexism, racism, and societal influences throughout engineered products and services. This can be seen through the racism and sexism inherent to many models used widely throughout engineering... Only through slowing down and using reflection as a tool of empathy, can we work to undo these negative societal forces.

C. ‘Why’ contemplative pedagogy: student outcomes

Sasha enters the class with few contemplative experiences and a narrow perception of contemplative practices. In their first reflective assignment, they establish a baseline for their experience sharing that, for one of their goals for the semester, they hope to “be able to consider the more human aspects of us when coming up with a problem or when exploring solutions, ... considering ethics, emotions, and perspectives.”

In their final reflective assignment, Sasha reflects on shifts in their engagement with the course and discusses how they themselves have changed:

At the beginning of this semester, I wanted to connect contemplative process with a traditional technical concept. At the time, that felt like a bold move. However, as I went through the course I realized I only did that due to my prior conceptions of what a "Physics" class should entail. Instead of being up in my head, I need to come from my heart. I need to develop empathy, resilience, and emotional intelligence to be able to fully engage as a learner. These skills are integral to STEM.

Sasha further reflects that in leaving "cold and lifeless" traditional "overly masculine STEM spaces," and beginning to live authentically, they place less attention on 'should do,' 'need to do,' or 'have to do.' In this way, they find more room to experience 'what is.' For example, Sasha uses the final project as an opportunity to focus on themselves and their goals within STEM education and the Physics course environment.

Regina, in contrast to Sasha, enters the class with many experiences with contemplative practices, and thus is familiar with and comfortable engaging in the contemplative space. At the start of the class, when setting goals for her engagement with the course, Regina focuses externally at the world around, unlike Sasha, who primarily looks internally. Regina does not seek to deepen her understanding of or relationship with herself. Instead, she focuses on how aspects of the course can be generalized to other learning processes and environments. She describes some of her goals in her first reflective submission:

I did some research... on education... and I would love to keep an eye on how this is represented in the class... I am very interested in education and making a more holistic learning experience and creating alternate methods that hopefully create positivity and I think that mindfulness is something very overlooked by many colleges...

In her ninth and tenth submissions, Regina shares more about how her experiences connect to her motivations:

I have had many experiences in my life that have led to me being secure in who I am and feeling like I belong in a way that I feel lucky to feel. This project is about being able to reflect and care for myself while also being able to share the incredible things I have experienced with others and to attempt to make the world a better place.

My understanding of contemplative practices has not really changed much... my understanding of others' interpretations has expanded... [I now] understand where people are coming from and how my understanding of contemplative practices is not universal and ... how it can be different.

Throughout the course, Regina's goals maintain this externalized lens, whether it is optimizing learning environments, sharing positive experiences, or understanding others' perspectives. For her, contemplative practices allow her to understand herself and others better, which helps her to better help others. This outward focus is also highlighted in Regina's reflections where she writes explicitly for an external audience, reporting her experiences for the benefit – and judgment – of someone

other than herself. The audience of her reflections remains external throughout the semester. In her final reflection, she justifies herself to a potential reader:

I acknowledge that this is only my opinion and am open to others, however with a lot of interactions and reflection I have come to feel fairly strongly in this idea and opinion.

In her eighth reflection, Regina shares that her mind is filled with thoughts, but instead of contemplating them, she states that her many thoughts "would confuse the reader more than anything as [she has] not sorted through these [herself]."

Regina focuses her attention on facilitating learning for others over herself, an external focus, in contrast to Sasha's internal focus. This differing focus, as well as distinct levels of experience with and perception of contemplative practices, lead to differing outcomes for these two students.

IV. CONCLUSION AND FUTURE DIRECTION

Future work will engage in data analyses from the rest of the students who consented to participate. Aligned with our prior analyses of students' final reflections [3][18], this paper's findings demonstrate contemplative pedagogy's potential to foster both personal growth and a more holistic understanding of learning. To this end, we invite instructors interested in leveraging contemplative pedagogy to explore invitational praxis [27] and provide space and time for students to connect their cognitive development with their affective and embodied experiences [e.g., 19]. Sasha's contemplative journey is characterized by a gradual internalization of emotions, which fostered a newfound self-empowerment. Initially struggling to engage affect, in part, due to privileging of cognitive ways of knowing, Sasha progressively embraces contemplative practices. In the process, they find greater connection with themselves, increased self-acceptance, and a sense of self-empowered resilience. Conversely, Regina, who enters the course with an existing familiarity with contemplative practices, maintains an external focus. Her reflections are centered around better understanding others, reflecting a goal of facilitating positive experiences for others. While this external focus does not lead to a significant change in her self-awareness, it broadens her understanding of the diverse interpretations and applications of contemplative practices among her peers. These preliminary analyses highlight the transformative potency of contemplative pedagogy in educational settings and dependency of students' outcomes on their individual learning foci. Sasha's transformative contemplative journey within the context of one semester in a physics course speaks volumes about the potential of contemplative pedagogy and also is a warning about the care needed to support student development. As well, a different path taken by Regina through this course signals the need for support and guidance of personalized goals and careful advising away from stagnation of "what is known."

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