

Mindfulness in Engineering v2

Mrs. Tracey Carbonetto, Pennsylvania State University, Allentown

My professional interests as an instructor of engineering are developing and refining methods of engineering instruction that will allow students to gain confidence and to increase their own success. Previous experiences in the metals and piping industry as a principal engineer have allowed me to promote necessary skills which need to be developed in the classroom so that the students have success upon graduation.

Ms. Eileen M Grodziak

Great Ideas for Teachers and Students:
Mindfulness Practices for Engineering Students
Tracey Carbonetto, Eileen Grodziak and Laura Cruz
The Pennsylvania State University

Engineering students benefit from clarity and focus while taking challenging classes. Engineering instructors employ various methods to cultivate focus through self-efficacy using practices intended to establish confidence and reduce apprehension. Lack of focus and clarity interfere with an engineering student's ability to learn especially when instructors are utilizing methods to promote otherwise. Students in first-year engineering courses may be apprehensive about the decision to study engineering not knowing what to expect. Instructors teaching first-year engineering courses may reduce apprehension in students by utilizing contemplative pedagogy. Contemplative pedagogy involves teaching methods designed to cultivate deepened awareness, concentration, and insight [1]. These techniques promote focus and clarity while reducing the anxiety that interferes with learning.

Concentration-enhancing and stress-relieving exercises in a first-year engineering classroom can alleviate stress in challenging classroom environments [2]. Typical techniques (meditation, breathing exercises, muscular relaxation) can be modified to encourage engineering students' participation: listening to repetitive tones of rotating machinery, observing the lines of a photograph displaying simple architecture, tracing the flow chart of a continuous engineering process. Clarity and focus are necessary in the success of a first-year engineering student. Any practices that promote these can benefit all engineering students.

Mindfulness practices promote convergent thinking and divergent thinking as students learn how to think as opposed to what to think. Mindfulness engages the senses opening the students' mind to a multitude of approaches to gain a solution. Practices that encourage an open mind and utilization of the senses will allow an engineering student flexibility in problem-solving.

Visual mindfulness can encourage engineering students to see their way through a problem. Using a photograph and asking the students if they can see negative and positive attributes will train students how to scan over an image and focus on the details. Students can learn to visualize the photograph as a three-dimensional object enhancing perspective, a beneficial skill for any engineer. The photographs can be related to an engineering topic such as a structural frame loaded properly or improperly. Audio mindfulness can encourage students to hear their way through a problem or process. The sounds of a large marine engine start-up can be played for engineering students in the class; a second recording where the start-up is modified can then follow. The students are asked to describe the differences in the two processes. Students will learn how to follow the process by hearing the sounds associated with each step and then recognizing when the steps are altered in sequence. Sensory mindfulness encourages students to "feel their way" through a problem or a situation. With safety of the utmost importance, students can be asked to rotate a collar onto a shaft and detect components that possibly do not fit correctly and why the fit is not correct.

Research demonstrates that practicing mindfulness improves the efficacy of (software) engineering students in the development of conceptual models. Instructors who practice mindfulness may find improved efficacy and resilience in first year engineering students in the development of their own academic models [3]. Most engineering students are optimistic as they begin their academic studies; many experience anxieties right the start. Putting an engineering student's mind at ease may become an integral step to a successful academic career. The authors contend that mindfulness practices will accomplish this through exercises that develop a sense of confidence and motivation in the students.

References:

- [1] Grace, Fran. (2011). Learning as a path, not a goal: contemplative pedagogy- its principles and practices. *Teaching Theology and Religion*.
- [2] Jennings, P., Snowberg, K., Coccia, M., & Greenberg, M. (2011). Improving classroom learning environments by cultivating awareness and resilience in education (CARE): results of two pilot studies. *The Journal of Classroom Interaction*, 46(1), 37-48.
- [3] Bellinger, David B; DeCaro, Marci S. (2015). Mindfulness, anxiety, and high-stakes mathematics performance in the laboratory and classroom. *Consciousness and Cognition*, v. 37 pp. 123–132.

