A Model for Human-Centered Engineering Education: What Faculty Are Saying

Amber Young-Brice, PhD, RN, CNE
Allison Murray, PhD; Somesh Roy, PhD; Lisa Chase, EdD; Jenna Lassila, M.Ed.

Background

BETTER: broaden engineering teaching with theory-based educational resources

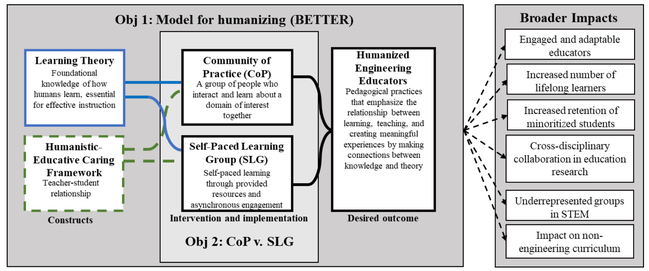
- Despite numerous faculty development initiatives focused on pedagogy, long-term changes in faculty pedagogical transformation is lacking.
- Many faculty development opportunities focus on the behavioral domain while missing the reality that faculty approach their teaching based on their beliefs and conceptions about teaching and student interactions, which are parts of the **affective domain**.

We contend that the missing focus on the **science of learning** and the impact of **teacher-student interactions** is the reason behind the low efficacy of faculty development activities in changing beliefs and behaviors.

Purpose

We aim to positively influence the development of engineering faculty by focusing on learning theories to impact change in pedagogical beliefs, attitudes, and behaviors.
We propose to use the model of Community of Practice (CoP) grounded in a humanistic-educative framework to move the direction of engineering education towards whole person learning through learning theory education.

Guiding Objectives



1. Examine the impact over time of a faculty development curriculum grounded in a humanistic-educative framework for promoting a humanizing model to engineering education.
2. Examine the impact of a Community of Practice as a faculty development opportunity to compel faculty to make active efforts to transform their beliefs and attitudes regarding the use of learning theory as part their teaching practice.

What Faculty Are Saying

In response to Obj. 1:
As a result of participating in BETTER, faculty reported making several **adaptations** to their teaching and student interactions, including:

- Increasing their welcoming behavior toward students by revising wording in their syllabus; spending more time before, during, and after class trying to get to know their students personally; and increasing how much they explained the reasoning behind their teaching, assessment, and grading practices.
  Faculty who implemented these welcoming practices reported that students seemed more engaged in their classes and more willing to approach them with questions.
- Increasing their flexibility toward students' lives outside of class by modifying late work and missing work policies and being willing to listen and demonstrate empathy toward the challenges students were facing in their personal lives.
  Faculty who implemented these flexible practices believed their accommodations may have led to more students remaining in their classes instead of dropping, but they worried that some students who may have tried to take advantage of their leniency.
- Increasing their use of real-world examples and connections to their field to help students engage with and master the material. For example, one faculty member reported implementing "in the media" segments of class time when they discussed class-related concepts in the news, and another faculty member shared examples from their work in the field and asked students to do the same.
  Faculty who increased their use of real-world examples and connections to their field reported that student participation was high during those discussions, and overall student engagement seemed to increase.
- Increasing their use of active learning and student-directed inquiry-based learning, especially for design projects and in-class problem-solving activities.
  Faculty who implemented these practices found that some of their students understood the material better and performed better on exams.

Faculty reported wanting to change even more about their teaching and student interactions, but they cited several **barriers** to making desired changes, including:

- Time
- Classes that vary widely, such as very small (<15) graduate classes and very large (>100) undergraduate classes, which resulted in a need for drastically different approaches to teaching and student interactions.
- In terms of what they had learned during the better summer program, not enough recall of what they had learned and/or lack of understanding the data, evidence, and practical applications supporting that the learning theories will work effectively in engineering classes.
- Challenging student characteristics, such as disengagement, absenteeism, and prioritizing grades over learning.

In response to Obj. 2:

- Those who participated in the in-person CoP reported valuing the in-person discussions and the ability to process as a whole group and in small groups. They believed that they would not have gotten much out of an online version, and they much preferred being able to meet in person.
- Faculty who participated in the self-paced learning group all reported that the format was convenient for them and that they would not have been able to participate in in-person due to location or other obligations. Additionally, all of them reported that they did not get as much out of the experience as they may have if they had been able to have synchronous discussions with the other participants; they found that the asynchronous discussion posts were not an adequate substitute for live discussion.
- The in-person CoP faculty were able to provide more specific examples of changes they had made, or planned to make, to their practices, as a result of what they learned during the summer. On the other hand, the self-paced online faculty were able to recall and define more specific learning theory terminology, even though they were less likely than the in-person CoP faculty to have implemented the theories in their teaching practice.

Study Participants

Participant Demographics, N=19	***n***
Disciplines Represented	
Biomedical	3
Chemical	1
Civil	4
Civil Environmental and Geodetic	1
Computer Science	2
Electrical and Computer Science	1
Environmental	1
Integrated Science and Engineering	2
Mechanical	2
Mechanical and Aerospace	2
Types of Schools Participants From	
R1	8
R2	11

In-Person Cohort *n*=10

Online Self-Paced Cohort *n*=9

Next Steps

DATA for Cohort 1:

- Pre/post General Teaching Survey data analysis
- Classroom observations
- Artifact collection and analysis

BETTER PROGRAM:

- Cohort 2 started May 30th, 2024
- In-person: 9 participants from 5 different universities
- Self-Paced online: 14 participants from 9 different universities

Acknowledgements

- This material is based upon work supported by the National Science Foundation under Grant No. 2236075. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

OPUS College of Engineering
MARQUETTE UNIVERSITY

MARQUETTE UNIVERSITY
BE THE DIFFERENCE.