Collaborative NSF funded research at UNC addresses diversity in STEM-C

Collaborative Research- Introducing High-School Students to Computational Thinking in Industrial Automation **is a three-year project funded by the National Science Foundation/ Division of Research on Learning (Award #1842342) through 2021.**

Christina M. Taylor christina.taylor@unco.edu
Jennifer C. Parrish jennifer.parrish@unco.edu
David A. Slykhuis david.slykhuis@unco.edu

Introduction

Females continue to be underrepresented in STEM-C fields. This holds true in mechatronics degree programs where currently fewer than ten percent enrolled are women. In this research project a collaborative coalition of universities, community colleges, and high schools in CO, VA, and ME actively seek to support the entry and success of under-represented populations in the field of mechatronics, and address outdated stereotypes and barriers in the process. Local partners include the University of Northern Colorado, Aims Community College, and Northridge High School.

What is mechatronics?

Mechatronics is a growing occupational field in manufacturing which encompasses mechanical engineering, electrical engineering, and computer science.

Overall project goal

The overall goal of this mixed methods research project is to encourage a larger and more diverse population of high school students to consider careers in mechatronics and to better prepare students who enter this career path.

Specific goals

- To develop computational thinking
- To recruit diverse students to STEM-C
- To increase manufacturing capacity

Research question

To what extent does working with *Make To Learn* activities encourage broader participation and retention of female and under-represented students in a career path in the field of mechatronics?

Make To Learn
Bringing the Art of Making to Learning

https://www.maketolearn.org/creating-art-animations-and-music/

Assessment

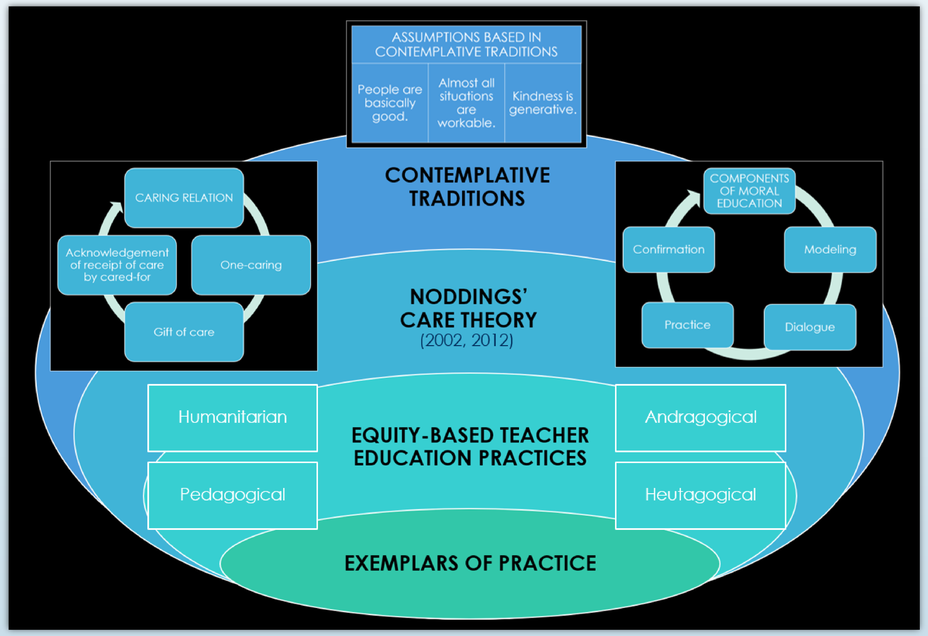
Mixed methods will be used to assess project outcomes.

- Observations
- Artifact analyses
- Task-based interviews
- STEM-C focused interviews
- Computational thinking assessment instruments

Book chapter written within the larger study: modeling care theory and contemplative equity-based practices in online teaching which support social and emotional connections with undergraduates

Abstract: Integral to high quality preservice teacher education is the modeling of desired behaviors by faculty in higher education which students may adopt for their own and integrate into future teaching practices. In this chapter, two faculty reflect on a yearlong experience teaching online synchronous science education and asynchronous early childhood education undergraduate courses during the COVID-19 pandemic. A culture of care and contemplative equity-based practices modeled during this time and their practical outcomes are explored. Exemplars about making social and emotional connections with students serve to directly support teacher education practices as well as constituents of online learning environments. Suggestions for future research regard student voice and societal health. (Funded in part by NSF Grant 1842342.) ***Keywords:*** asynchronous online teaching, care theory, contemplative practices, early childhood teacher education, democracy, equity-based practices, science teacher education, social and emotional teacher-student connections, student voice, synchronous online teaching, teacher education

A nested graphic representation of contemplative traditions, care theory concepts, and exemplary equity-based teacher education practices



Care-based exemplars are offered with the hope they will serve to directly support teacher education practices

SITUATION: A student reported she tested positive for COVID-19. Her coursework was complete except for her final exam. **RESPONSE:** The faculty member gave the student the option of not taking the exam and accepting her grade to date as her final grade so she could take care of herself. **OUTCOME:** The student opted not to take her exam, expressed in writing profuse relief and gratitude for the care she had received, and then focused on her health.

Considerations for future practice in NSF grant work and undergraduate teacher education courses

- Prioritize care over content knowledge/skill acquisition.
- Create opportunities for non-dominant narratives to surface.
- Model vulnerability.
- Model reflection and reflexive action.
- Act intentionally and offer explanations of decisions made.
- Keep the glass balls in the air. (Dyson, 1991) This is not the semester to change the world. (Or is it?)

References

Dyson, B. (1991, September 6). Georgia Tech 172nd Commencement Speech. https://www.markturner.net/wp-content/uploads/2015/05/Whistle-Brian_Dyson-Georgia_Tech_Commencement_Sept_1991-p3.pdf

Noddings, N. (2002). *Educating moral people: A caring alternative to character education*. Teachers College Press.

Noddings, N. (2012). The caring relation in teaching. *Oxford Review of Education, 38*(6), 771-781. doi:10.1080/03054985.2012.745047