EOP Integration in Engineering Technology Education

Project Team: Dalya Ismael (Civil Engineering Technology), Vukica Jovanovic (Manufacturing Engineering Technology), Murat Kuzlu (Electrical Engineering Technology), Charles Lowe (Mechanical Engineering Technology)

Introduction

- Old Dominion University's Engineering Technology Department integrated the Engineering for One Planet (EOP) framework into its curriculum.
- The implementation spanned four programs: Civil, Mechanical, Electrical, and Manufacturing Engineering Technology.
- Each course incorporated one or more core learning outcome from the nine topics in the EOP framework.
- The integration was supported by projects, assignments, guest speakers, and field trips, with common elements including a photovoice assignment and a retrospective survey. Results showed a positive impact on student engagement and understanding of sustainability principles.
- This initiative equipped students with the skills and knowledge to develop sustainable engineering solutions for real-world challenges.

Methodology

- The project team selected one core learning outcome from each of the nine topics in the EOP framework and integrated them into four Engineering Technology courses: ENGT 435W Senior Design Project, ENGT 434 Introduction to Senior Design Project, MFET 450 Lean Engineering, and CET 355 Sustainable Building Practices.
- Each course was updated to integrate specific EOP topics and their corresponding core learning outcomes, as shown in the table below.

	Course Name	EOP Topics	Learning Outcomes
1	CET 355 Sustainable Building Practices	• Systems Thinking • Environmental Impact Assessment • Materials Selection	ST Core 1 EIA Core 1, 3 MS Core 1, 6
2	ENGT 434 Introduction to Senior Design Project	• Social Responsibility • Critical Thinking • Communication &Teamwork	SR Core 3 CT Core 5 C&TW Core 1
3	ENGT 435W Senior Design Project	• Design	D Core 1
4	MFET 450 Lean Engineering	• Environmental Literacy • Responsible Business & Economy	EL Core 1, 2 RBE Core 1, 2

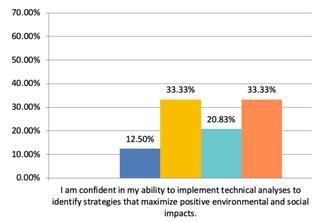
- These updates were embedded into various aspects of the courses with common elements across all four courses being Photovoice assignments, and retrospective surveys, used to assess the impact of the course modifications on students' understanding and engagement.

Qualitative Results

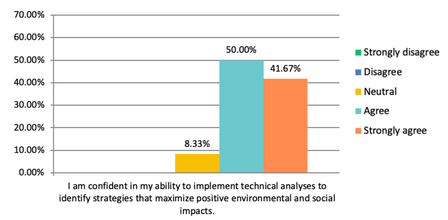
- The retrospective survey questions were consistent across all courses; however, each set of survey results corresponds to the learning outcomes selected for that specific course, with the x-axis highlighting the outcomes based on the EOP framework.

ENGT 435W - Please indicate the extent to which you agree or disagree with the following statements:

BEFORE completing the course:

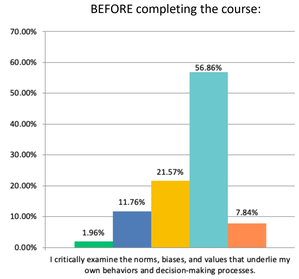


AFTER completing the course:

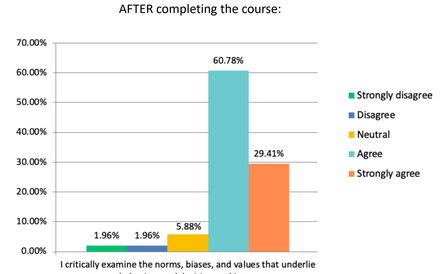


ENGT 434 - Please indicate the extent to which you agree or disagree with the following statements:

BEFORE completing the course:

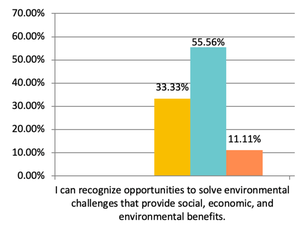


AFTER completing the course:

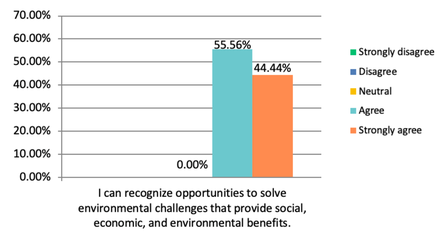


MFET 450 - Please indicate the extent to which you agree or disagree with the following statements:

BEFORE completing the course:

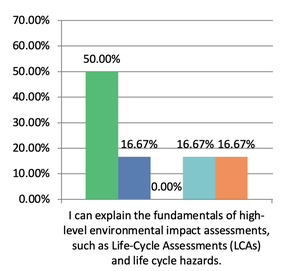


AFTER completing the course:

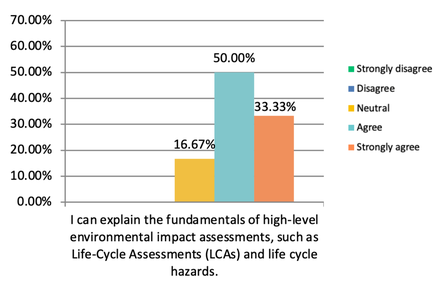


CET 355 - Please indicate the extent to which you agree or disagree with the following statements:

BEFORE completing the course:



AFTER completing the course:



Quantitative Results

- What aspect of this class helped you understand the role of engineers in ensuring solutions are sustainable long-term?

ENGT 435W

ENGT 434

MFET 450

CET 355

Conclusion & Future Work

- Students demonstrated significant increases in confidence and ability to apply sustainability principles, as shown by the retrospective surveys across all courses.
- Learning improvements included conducting environmental impact assessments, applying systems thinking, and making sustainability-focused decisions, with progress in understanding course-specific topics such as lean engineering and life-cycle analysis.
- Word clouds revealed that students valued themes such as "sustainability", "solutions", "long-term thinking", and "lifecycle" across all courses, indicating the retention of knowledge among the students.
- The integration of the EOP framework effectively engaged students and reinforced their understanding of sustainability in engineering. Future iterations can build on this success by further aligning course activities with student feedback and evolving sustainability challenges.
- Future work will include expanding the application of the EOP to incorporate it into additional courses taught by faculty members, aiming to spread these practices across more faculty members outside the project team.