The Wicked Engineer: Centering Intercultural Competency and Equity (Resource Exchange)

Dr. Patrick Sours, The Ohio State University

Dr. Patrick Sours is an Assistant Professor of Professional Practice in Engineering for Sustainable Development and serves as the Faculty Lead of the Humanitarian Engineering Program at The Ohio State University. In this role, he leads high-impact experiential learning programs, conducts engineering education research, and instructs courses related to Engineering for Sustainable Development. He is passionate about developing engineers' sociotechnical competency to prepare them to address complex global sustainability challenges

Cherish C. Vance, The Ohio State University

Cherish Vance (she/her) is an incoming Assistant Professor in the Department of Food, Agricultural and Biological Engineering at The Ohio State University. Her research passions include engineering for sustainable development. A first-generation student, she is currently a PhD candidate and has received a Bachelor of Science in Biological and Agricultural Engineering from Texas A&M University.

The Wicked Engineer

Centering Intercultural Competence and Equity

Wicked problems are complex issues without clear boundaries, such as climate change, food security, access to clean water, and growing inequality. This course encouraged participants to become wicked engineers who can tackle grand challenges.

"My favorite assignment was identifying a wicked problem, identifying why it was a wicked problem, proposing a solution to the problem, and explaining how the potential solution related to the pillars of sustainability."

- Participant, 10th grade

Buckeye Precollege Institute

Target Grades: rising 11th & 12th

11 students, 10 days, endless fun.

Day	Topics	Morning Activities	Afternoon Activities
1	Formation of Engineers to Address Wicked Problems (FEW) Overview	Introduction to Engineering HW: Reading: What Are Wicked Problems and How Might We Solve Them?	Watch: And Water for All
2	Intercultural Competence	What is intercultural competence? How to Make Toast	Reading: The Body Ritual Among the Nacirema
3	Concepts of Sustainability	Engineering for One Planet Framework	Six Pillars of Sustainability (OSU) Debate on National Parks
4	United Nations Development Goals and the Role of the Engineer	Video: Sustainable Development Goals explained	Movie: The Boy who Harnessed the Wind
5	Human Centered Design	If the shoe fits... ...activity	Design with Communities Considerations
6	Humanitarian Engineering Applications	Examples of Humanitarian Engineering Projects	Tour of OSU EnCORE House and 4H Center LEED Certified Building
7	Justice in Engineering and Environmental Practices	Case Study Play pump	Tour of Humanitarian Engineering Lab
8	Justice and Social Responsibility in STEM	TED Talk: Engineering and Social Justice	Industry Spotlight: Pantheon Builders
9	Reflection and Discussion	Round Robin Activity with Student Learning Outcomes	No Sessions

Student Learning Outcomes

- **Analyze the dynamics, complexities, and interdependencies of wicked problems.**
- **Understand and identify appropriate technology.**
- **Identify and apply appropriate community development frameworks.**
- **Apply concepts of sustainability.**
- **Integrate engineering, technology, science & socio-cultural knowledge context.**
- **Understand potential career paths focused on using engineering to have impact.**

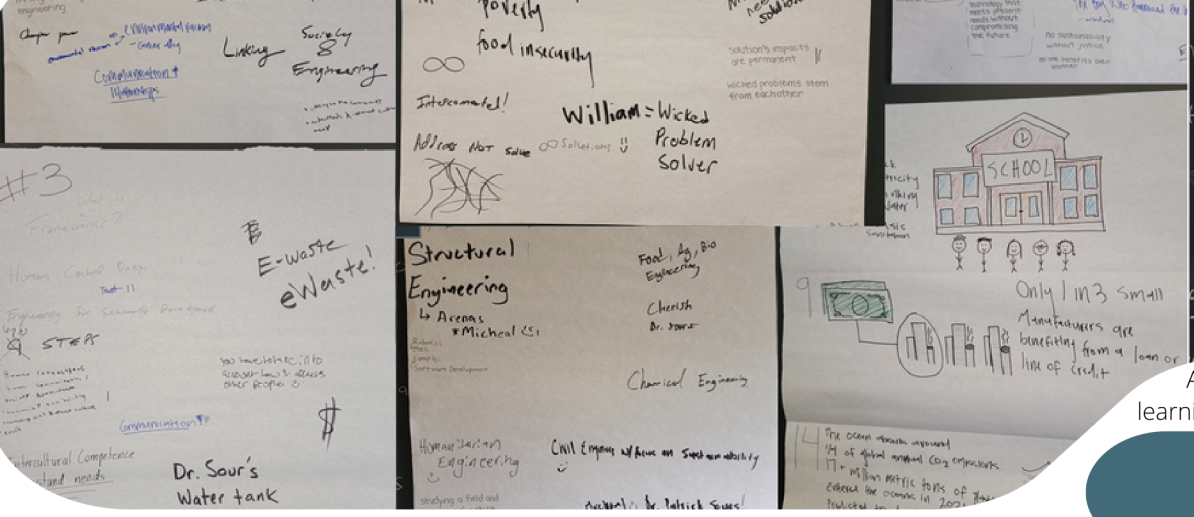
Buckeye Precollege Summer Institute

Participants enrolled in a single, intensive course during a two-week stay on Ohio State's Columbus campus. This deep-dive courses was custom designed and taught by OSU's expert faculty and staff. Participants investigated real-world challenges through hands-on, project-based learning while experiencing college-level coursework and gaining the academic skills needed to become successful, independent learners.

Below: Students playing "Four on a Couch" while memorizing and articulating the UN SDGs

Patrick J. Sours
sours.17@osu.edu

Cherish C. Vance
vance.487@osu.edu



Above: Students used Jigsaw cooperative learning to explore the pillars of sustainability

HELPFUL RESOURCES

SUSTAINABILITY

Engineering is crucial for sustainable development ...vital in addressing basic human needs such as alleviating poverty, supplying clean water and energy, responding to natural hazards, constructing resilient infrastructure, and bridging the development divide, among many other actions (UNESCO, 2021). Students and engaged with *different frameworks of sustainability*, such as economic, environmental, and social pillars.

INTERCULTURAL COMPETENCE

Students engaged in self-reflection and dialogue about intercultural considerations and explored potential STEM career paths that address disparate effects on minoritized or underserved communities. Many intercultural learning activities were used, such as the *Tree Activity, Name Activity, Cultural Iceberg, Identity mapping.*

HUMAN CENTERED DESIGN

Human-centered design is a creative approach to problem solving. Human centered design is framed around creating empathy with end users; brainstorming ideas, sharing designs and iterating on them; prototyping; and eventually putting a new solution out in the world. Students explored *How to Make Toast* as a design thinking activity. IDEO.org.

Engineering for One Planet

Tool for educators to embed sustainability into engineering education. A curated list of core and advanced sustainability SLOs that all engineering students should acquire was co-created by hundreds of experts from a range of identities, lived experiences, geographies, & sectors including academia, industry, nonprofit, government, and philanthropy

ACTIVITY

If the Shoes Fits... Students completed portions of this guide which is a collection of process related activities for a system to begin discussing the information needed to make appropriate technology selections. https://www.rcac.org/wp-content/uploads/2014/12/Appropriate-Technology-Guide.pdf

HubICL

a collaborative space for individuals and institutions to learn and grow from one another's ideas, programming, and resources on intercultural learning. bringing connection and fostering relationships between students, teachers, scholars, and professionals by digitally sharing vocabulary and methods.

Impact Engineering Lab Tour

Students toured the Impact Engineering Lab and learned about passive gravity water treatment.

Guest Lectures

Students heard from engineering and community development professionals about career paths and environmental justice

Encore House Tour

The Encore House was designed to achieve net-zero status through many passive and active design strategies to minimize energy losses, while maximizing energy efficiency.