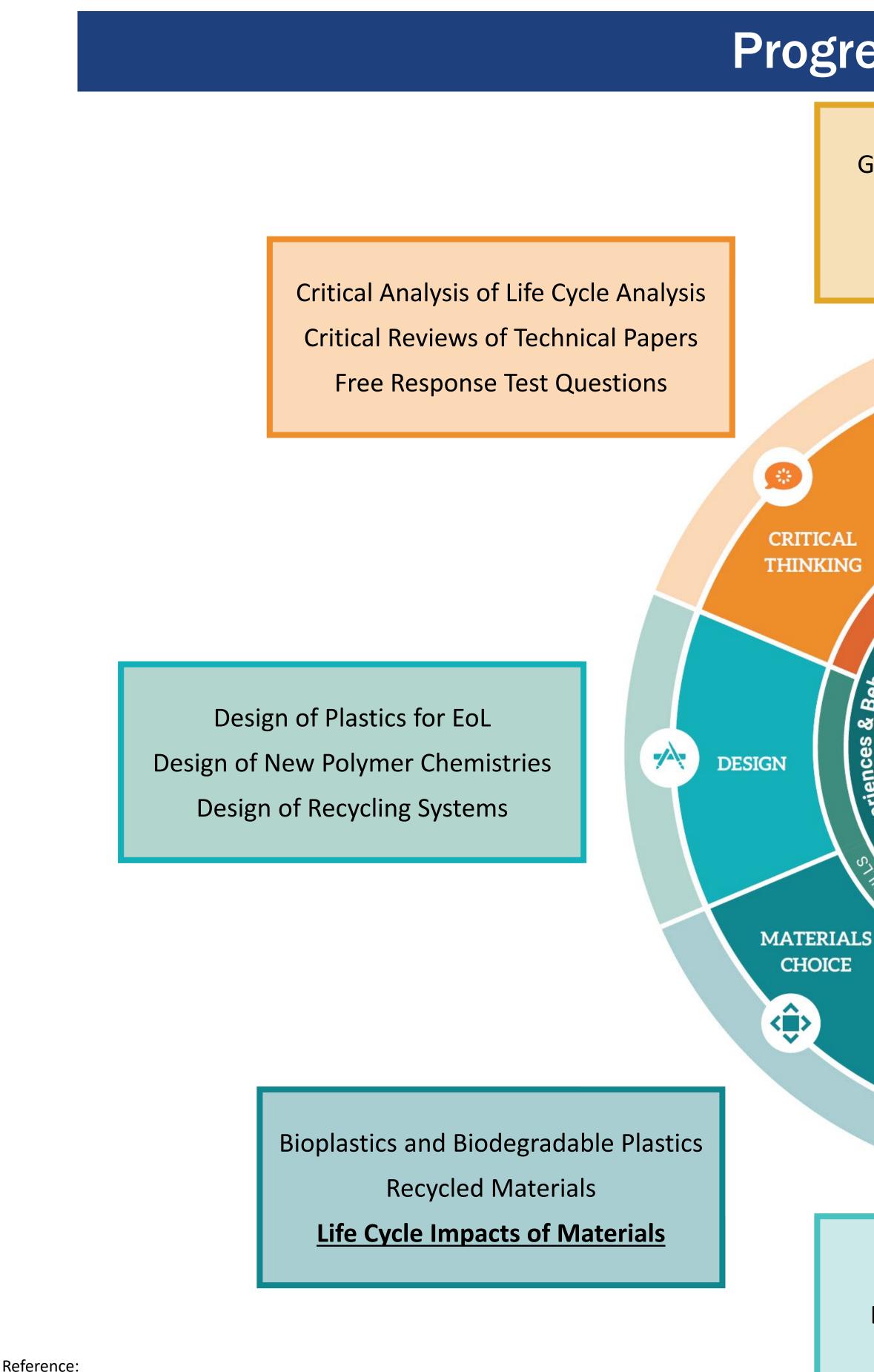


Introduction

- The Plastics industry has suffered from sustainability challenges for a long time
- Students entering the industry need to understand the issues and best-practices associated with improving the sustainability the plastics industry
- PES 320: Polymer Sustainability is designed impart this knowledge to students
- The EOP framework was used to improve co content and discussions on additional aspect sustainability



The Lemelson Foundation (2022). The Engineering for One Planet Framework: Essential Learning Outcomes for Engineering Education

Teaching Polymer Sustainability at the Undergraduate Level

Dr. Gamini Mendis,

Plastics Engineering Technology and Polymer Engineering and Science Penn State Erie – The Behrend College

		Course Outlin
	•	Fundamentals of Sustainability
	•	Economics and Supply Chains
y of	•	Plastic Life Cycles
	●	Life Cycle Analysis
d to	•	Polymer Degradation and Risk
ourse ects of	●	Biobased, Biodegradable, and Cir
	٠	Plastic End-of-life technologies
	٠	Regulations
gress: EOP Framework Mapping		
Group Debates on Paper vs Plastic		

Life Cycle Analysis Group Presentations Fundamentals of Sustainability Life Cycle Impacts/Analysis ** Environmental Toxicity COMMUNICATION & TEAMWORK **ENVIRONMENTAL** LITERACY SYSTEMS THINKING nterconnectedness to ecological system[△] **ESPONSIBLE** • Tradeoffs and impacts **Externalities and Regulations** within systems[△] BUSINESS Materials and Additive Impacts Designs are systems^{∆∞} ECONOMY Connection and collaboration **Ethics and Responsibility** with other disciplines $\Delta \infty$ • Planetary system boundaries[∞] SOCIAL RESPONSIBILITY **ENVIRONMENTAL** IMPACT MEASUREMENT Supply Chain Impacts Plastic Impact on Communities Environmental Toxicity Life Cycle Analysis Workshops Energy Consumption Discussion

Toxicity of Chemicals

rcular Plastics

- assessments to each class
- Identify opportunities for hands-oninteraction
- Team life cycle analysis debate
- business decisions
- discussion

Progress and Plan for Scaleup

- Next steps:
- **Discord office hours**
- Youtube outreach

Acknowledgements

and Larry Nies.

Procedure

Mapped learning objectives, activities, and

 Inclusion of engineering ethics/responsible • Beach plastic cleanup trip, microplastics

Identified additional topics for discussion

Supply chain impacts on minorities, lowincome communities, other countries

Hand-on functional unit example Peanut butter and jelly sandwich

• Discussion of the obligation of the engineer and responsibility for plastics engineers

• Pre/post class survey on sustainability

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