Building Core Competency:

A Sustainability Curriculum for Product Design

Heidrun Mumper-Drumm
Professor / Academic Director Sustainability Initiatives / ArtCenter College of Design
Jonathan Abarbanel
Associate Professor - Product Design / ArtCenter College of Design

1 INTRODUCTION / Expansion of Sustainability Themes

Design for Sustainability was recognized as a key learning outcome for students in the ArtCenter Product Design Department. To accomplish this, the authors developed a new curriculum model to integrate carefully selected sustainability content into all core (required) studios.

These goals guide our current development and deployment of the curriculum:

- broaden and enhance existing curriculum
- encourage and stimulate student and faculty interest
- raise the quality and the scope of design outcomes
- equip students with design strategies, including adapting to and mitigating climate and resource disruptions
- prepare students as advocates and leaders in design and innovation for a healthy planet

2 PROCEDURE & METHODS / Sustainability Ladder

A Sustainability Program Learning Outcome (S-PLO) was adopted for the Product Department:

Evaluate, design, and advocate for sustainable solutions, processes and behaviors across environmental, social/cultural, and economic pillars.

For each Term's core studio, a Theme describes the topic area, followed by the specific Sustainability Course Learning Outcomes (S-CLOs). Modules are proposed to provide guidance, references, standards and other supporting items for faculty, including a set of Sustainability Strategies to exercise student competency.

3 PROGRESS & SCALING / Sustainability Strategies

The Sustainability Strategies were developed by the authors and will be shared in a Faculty Workshop planned for the Spring Term. New Strategies that speak to values and cultural and social impact (Diversity, Equity, Inclusion, Justice) will be added.

4 EVALUATION & IMPACT / Student Projects

To communicate the impact of sustainability learning, a visualization of the breadth of sustainability related student projects and recognition received (awards) was created. This initial Diagram will be expanded and updated to provide an ongoing tracking of curriculum effectiveness.

The first cohort of 44 students entered the Product Design Program in Fall 2022, which will be followed by a new cohort each term. The first opportunity to evaluate educational impact, understanding of sustainability, and new competencies will be in the Summer Term 2023.

ACKNOWLEDGMENTS / REFERENCES

We are grateful for the contributions of students and faculty, in particular B. Strousse.

We would also like to thank our EOP Mentors:
Stefanie Koehler and Meagan Wengrove

Daly, S.R., Gonzalez, R., Seifert, C.M., Yilmaz, S., (2016), Evidence-based design heuristics for idea generation, In: Design Studies, Volume 46, 2016, Pages 95-124, ISSN 0142-694X, https://doi.org/10.1016/j.destud.2016.05.001.

Engineering for One Planet, (n.d.), Engineering for One Planet Initiative, https://engineeringforoneplanet.org/

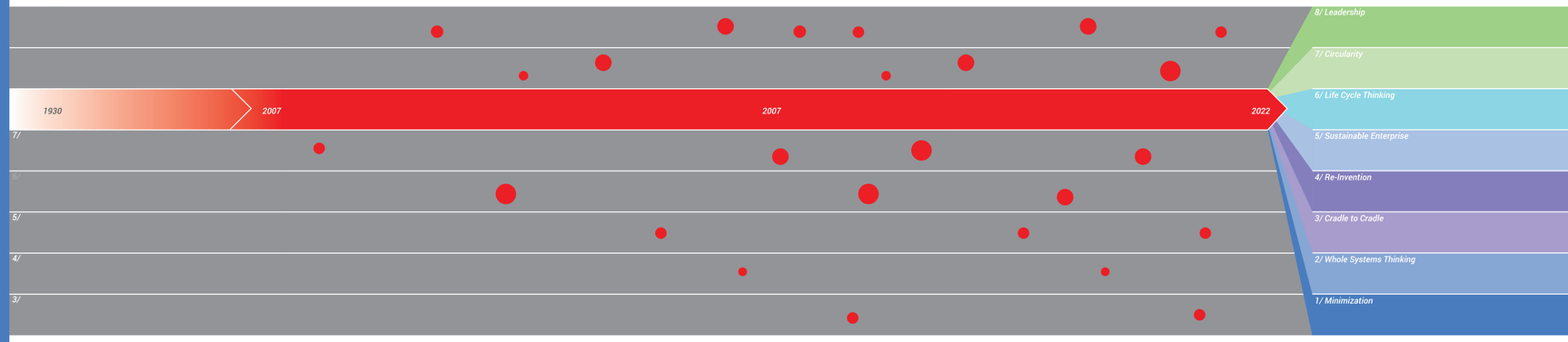
Engineering for One Planet, (2022), The Engineering for One Planet Framework, The Lemelson Foundation in partnership with VentureWell, https://engineeringforoneplanet.org/wp-content/uploads/2022_EOP_Framework_110922.pdf

Sustainable Minds (n.d.), Eco-concept + LCA Software, Sustainable Minds, http://www.sustainableminds.com/software

White, H., St. Pierre, L., & Belletire, S. (2014). Okala Practitioner, Integrating Ecological Design. Phoenix, Arizona: Okala Team.

United Nations, Dept. of Economic and Social Affairs (n.d.), Sustainable Development Goals, United Nations, https://sdgs.un.org/

1 Expansion of Sustainability Themes and Integration Into 8 Terms of Core Courses



2 Sustainability Ladder Providing a Scaffold for Progressive Learning

Sustainability Curriculum Ladder per Term	Sustainability CLOs (S-CLOs) per Term	Supporting S-CLOs per Term	8 Strategy Categories Mapped to S-CLOs
8/ Leadership	Demonstrate systems thinking and high level competency in sustainable design strategies and best practices, and effectively communicate the imperative to design for sustainability	8a/ Integrate and demonstrate ability to use all learned sustainable design skills 8b/ Visualize and effectively present project concepts and communicate environmental, social/cultural and economic values to stakeholders	Bi Sy Pk *Values Based Dm Rm Ln Fp
7/ Circularity	Apply sustainable design strategies and best practices, communicate the value of sustainability and costing throughout the design and manufacturing processes, and strive to model a circular system.	7a/ Transparency in communicating brand values 7b/ Familiar with best practices of brands [enterprises?] that include sustainability as part of stated values and mission	Bi Sy Pk Dm Rm Ln Fp
6/ Life Cycle Thinking	Conduct research, analysis, and critically compare life cycles, use sustainability strategies to innovate product/service systems, and demonstrate principles of responsible design throughout their career.	6a/ Able to conduct life cycle (LCA) research and create LCA-based design goals 6b/ Able to apply sustainability strategies to create innovative design concepts 6c/ Able to compare life cycle impacts of product/service systems concepts	Bi Sy Pk Dm Rm Ln Fp
5/ Sustainable Enterprise	Transparently communicate a brand's sustainability across economic, social and environmental spectrums.	5a/ Communicate sustainability using metrics and visualization 5b/ Visualize and narrate the product/service ecosystem 5c/ Apply systems thinking to UX/UI	**Sy** Systematize **Pk** Repackaging
4/ Re-Invention	Apply design strategies that support responsible development and reduce negative impact, and effectively communicate the product/service system value proposition.	4a/ Use of design to reduce the environmental impact of product/service and system 4b/ Able to compare sustainable design solutions with reference designs 4c/ Able to use sustainable design strategies to explore and propose innovative product/service system solutions	**Bi** Biophilic **Sy** Systematize **Pk** Repackaging (4 sub-strategies)
3/ Cradle to Cradle	Apply cradle to cradle principles to reduce the environmental impact of product design and/or supporting ecosystem compared to a reference product.	3a/ Able to speak about and refer to pertinent UN SDGs 3b/ Familiar with sustainable materials and cradle to cradle characteristics 3c/ Use of behavioral strategies to align with sustainable consumption	**Rm** Rematerialization **Bi** Biophilic **Sy** Systematize
2/ Whole Systems Thinking	Understand system components, characteristics and relationships, and create and evaluate a re-generative product/service system.	2a/ Familiar with the UN SDGs and their system relationships 2b/ Familiar with principles of natural and human-made systems 2c/ Able to apply systems thinking strategies to address sustainability	**Ft** Footprints (4 sub-strategies) **Bi** Biophilic (3 sub-strategies) **Sy** Systematize (4 sub-strategies)
1/ Minimization	Awareness of materials and material choices as they pertain to sustainable design and familiarity with strategies for minimizing material use and reducing harm.	1a/ Familiar with the UN SDGs and general understanding in a design context 1b/ Able to use minimization strategies in concept development and prototyping	**Dm** Dematerialization (3 sub-strategies) **Rm** Rematerialization (3 sub-strategies) **Ln** Longevity (5 sub-strategies)

3 Sustainability Strategies Development of Values Based Cultural/Social Heuristics

30+ *and growing*

Dm *Dematerialization (3 sub-strategies)*	***Rm*** *Rematerialization (3 sub-strategies)*
Ln *Longevity (5 sub-strategies)*	***Ft*** *Footprints (4 sub-strategies)*
Bi *Biophilic (3 sub-strategies)*	***Sy*** *Systematize (4 sub-strategies)*
Pk *Repackaging (4 sub-strategies)*	****Values Based***

*work in progress

4 Student Projects, Recognition, and Leadership