



## Educating Students to Become Sustainable Design Leaders: Opportunity through Material Selection Systems.

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As sustainability and sustainable design are increasingly included in processes and policies in industry for fabricators and suppliers, and for the public, including business owners and consumer customers, Higher Education is responding by addressing these topics in design degree programs and courses. In a recent analysis of collaboration strategies engaging Fashion Design and Interior Design students in the study of sustainable design topics, applications and practice, the authors identified three themes acknowledging multi- and interdisciplinarity in design education curriculum: *The Social Dimension of Design*, *The Interdisciplinary Design Process*, and *Holistic Thinking* and these three themes were illustrated as the interconnectedness of relevant topics and implications for teaching and research (Trippeer et al, 2022).

*The Social Dimension of Design* addresses the role of the consumer and acknowledges the evolution of consumer behavior, including the impact of technology on procurement, and connections to health and well-being acknowledging user-assigned value associated with lifestyle choices. Teaching strategies require that students develop relationship-based communication skills preparing them to engage with a variety of individuals and entities, and to adapt to changes over time in technology and consumer attitudes. Learning outcomes include “interpersonal” or “soft skills” involved in interviewing, communicating, observing, narrative writing and adaptability across multiple modes and over time. In *The Interdisciplinary Design Process* theme, design engages Design Theory, History and Economics, and the Humanities. Design Theory identifies the human being and the social body as informed by the social sciences. Materiality addresses sensory qualities, health, and well-being, and connects design, art, craft, and business processes. These knowledge categories require that students understand historical precedents, cultural relationships, and materiality beyond aesthetics. Skills include both quantitative and qualitative research analysis and multi-sensory synthesis. *Holistic Thinking* is required for the comprehensive understanding of the role of the consumer and sustainable design practice-based criteria. Tactics include acknowledgement of an international scope, systems thinking, and inclusion of national and international criteria for sustainable materials, project, and product design. Course delivery includes life cycle analyses and real-world learning scenarios.

Based on three themes in (Trippeer et al., 2022), additional research on sustainable design education was conducted, specifically addressing studies of Higher Education Institutions (HEI) teaching for sustainable competency across multiple disciplines. Key categories include learning

theory models, delivery modes, the teacher's role, and learning outcomes. Many international projects frame their studies in the holistic context of Sustainable Development Goals (SDGs) (e.g., Alm et al., 2022), or Education for Sustainable Development (ESD) (Abner et al., 2019). Learning outcomes include competencies related to high order learning or *systems-thinking*, (Alm et al., 2022; Abner et al., 2019; Sumter et al., 2020; Bugalo-Rodriquez & Vegal-Marcote, 2020.; Tejedor et al., 2019.), project-based experiences, *real world learning* or *active learning* (Abner et al., 2019; Alm et al., 2022; Bugalo-Rodriquez & Vegal-Marcote, 2020.; Gam, et al., 2022; Tejedor et al., 2019.) and *interpersonal competency* or the ability to communicate and collaborate with others beyond or outside of their own discipline (Abner et al., 2019; Alm et al., 2022; Gam, et al., 2022; Tejedor et al., 2019). Teachers are often required to challenge accepted higher education structures, curricula, curriculum mapping, pedagogies, and assume the role of *facilitator* (Lai & Peng, 2019; Tejedor et al., 2019). Based on qualitative and quantitative assessments and students' responses, researchers also recommended structuring a course assigning a project that is delivered across an entire semester, rather than a sequence of several smaller projects (Alm et al., 2022; Abner et al., 2019; Gam, et al., 2022).

This study focused on learning theories and pedagogical strategies that are supportive in the context of the three Themes identified in (Trippeer et al, 2022), as successful in supporting sustainable design education in multidisciplinary programs especially for fashion design, interior design majors. These design programs highlight emerging emphasis on health and well-being and support opportunities where material selection systems can be utilized to facilitate sustainability education. For this paper, the authors are taking the **Position** that addressing these multidisciplinary and interdisciplinary dynamics requires an examination of both curriculum and pedagogy. At the most basic level, the curriculum includes degree plans and course offerings while pedagogy addresses learning theories, teaching methods and how the material is delivered. Although educators are responding to the need for multidisciplinary sustainable design teaching, and assessments are being done, future curriculum development and studies generating both qualitative and quantitative research data are needed to assess the pedagogical models employed and the efficacy of these techniques. Without deliberate analysis, application, assessment, and continued improvement of all dynamics, students will not adequately attain the knowledge and the preparation required to be leaders in sustainable design practice. Therefore, proposed course delivery template models address the following components: (1) students' learning style modalities including concrete sequential, abstract sequential, concrete random, and abstract random (Zollinger & Martinson, 2010); (2) didactic structures including cooperative learning, circular economy, life cycle thinking, systems thinking, and service learning; (3) pedagogical models such as Kolb's Experiential Learning Theory (2014); and (4) the teacher's role. In this paper, we highlighted the importance of multicurricular development that meets the need to develop a more holistic and integrative model to teach sustainability in higher education, specifically in designers' and practitioners' material selection decisions that are made with a more comprehensive understanding of the potential impacts on the environment, society, and the economy.

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