

# TRANSFORMATIVE COLLABORATIONS FOR SUSTAINABLE MATERIAL SELECTION PRACTICES

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## ABSTRACT

In an era characterized by the pressing need for environmental sustainability, educational initiatives that empower students with the knowledge and skills to engage in sustainable practices are crucial. This paper presents a case study of a Collaborative Online International Learning (COIL) project that explores the transformative potential of intercultural collaborations in the context of sustainable material selection practices. The project, involving students from University of Monterrey (Mexico) and Oakland Community College (USA), challenged participants to research and specify sustainable materials for residential interiors while incorporating local artisanal, handcrafted elements. This collaborative approach transcends geographical boundaries, enabling students to delve into the complexities of sustainability, examine materials through a global lens, and consider cultural and environmental impacts. The project aligns with the United Nations Sustainable Development Goals (SDGs), specifically SDGs 9, 11, 12, 13, and 17, by incorporating international perspectives. The paper explores how the project's objectives, methodologies, and outcomes, nurtured the development of intercultural competence and collaborative partnerships while teaching responsible consumption, mitigation of climate change, and preservation of local traditions and cultural heritage. The findings demonstrate that such collaborative initiatives hold the potential to catalyse sustainable transformations in material selection practices, preparing the next generation of designers to contribute to a more environmentally responsible and culturally inclusive future. This case study serves as a valuable model for educators and institutions seeking to integrate intercultural collaboration and sustainable design into their curricula, offering a blueprint for addressing the pressing global challenges of our time.

*Keywords: Collaborative Online International Learning, sustainable material selection, intercultural collaborations, transformative learning, learning experience*

## 1 INTRODUCTION

In an era characterized by the pressing need for environmental sustainability, educational initiatives that empower students with the knowledge and skills to engage in sustainable practices are crucial. The reorientation of education towards sustainable development gave momentum in the early 1990s with UNESCO's Agenda 21 [1]. Among its objectives were to achieve environmental awareness, responsibility and commitment towards sustainable development at all educational levels. Recognizing the role of education as a means for creating a more sustainable future, the pivotal initiative United Nations Decade of Education for Sustainable Development (DESD) (2005-2014) followed by the Global Action Programme (GAP) (2015-2019) aimed to integrate the principles, values and practices of sustainable development into all aspects of education and learning. With its focus on nurturing a critical thinking and responsible citizenship, Education for Sustainable Development (ESD) is more than proposing add-ons to existing curricula but requires a fundamental change in mind-sets and behaviours. *"Sustainable development can only be progressed – or indeed achieved – through a critical understanding of its complementary parts – such as how environmental, socio-political and economic factors influence our lives, the impact our choices and actions have on sustainable development – and a commitment to make a positive difference in our world."* The current global framework for ESD 2030 [2] emphasizes the transformative power of education and its contribution to the achievement of the 17 Sustainable Development Goals (SDGs). It advocates for a holistic approach to learning to ensure that individuals understand sustainability challenges, become aware of their relevance to the surrounding realities and take actions to shape a different future [2].

## **2 THE CULTURAL DIMENSION OF SUSTAINABILITY**

Though grounded in environmental concerns, sustainability is interpreted holistically to encompass economic and social dimensions or ‘pillars’ [3, 4] alongside emerging aspects such as institutional [5], and cultural [6]. Culture, in particular, is increasingly acknowledged as a distinct pillar of sustainable development [6, 7, 8]. It is considered as both “a driver and an enabler of sustainable development” [9]. Culture-led development influences people’s lifestyle, behaviour, consumption patterns and interaction with the natural environment. It leads to greater social inclusiveness, resilience, innovation, creativity and entrepreneurship through the use of local resources, skills and knowledge. Moreover, culture-sensitive development approaches, which consider the needs of people and the cultural context, have a transformative power and are more likely to achieve sustainable, inclusive and equitable outcomes [10]. Hawkes defines culture as encompassing values and aspirations (content), the processes and mediums through which they are developed, received and transmitted (practice), and their tangible and intangible manifestations (results). He argues that sustainability “can only be achieved when it becomes an enthusiastically embraced part of our culture” [8]. Soini and Birkeland analyse the scientific discourse on cultural sustainability and organize it around seven story lines (heritage, vitality, economic viability, diversity, locality, eco-cultural resilience, and eco-cultural civilization) [6]. This framework highlights the diverse roles that culture plays in achieving sustainability, the complexity of the problems cultural sustainability addresses and its transdisciplinary character.

## **3 SUSTAINABILITY IN DESIGN**

In the field of design, the discourse on sustainability started in the mid-twentieth century with the pioneering work of visionaries like Rachel Carson, Buckminster Fuller, Victor Papanek, and E. F. Schumacher [11]. In the 1980s design for sustainability (DfS) emerged as a design approach integrating the principles of sustainability into the entire design process from conceptualization to end-of-life scenarios. Throughout the years its field has evolved from focusing on the improvement of existing products (product innovation level) and services (product-service system innovation level) to encompassing broader considerations such as the various scales of human settlements (spatio-social innovation level) and transitions to new socio-technical systems (socio-technical system innovation level) [12]. With its core intention to generate sustainable outputs, DfS serves as a catalyst for shaping new directions, lifestyles and approaches to satisfying people’s needs [13].

Vezzoli and Manzini summarize designers’ efforts to interpret sustainability into four categories - selection of resources with a low environmental impact, design of product life cycle, system-design for eco-efficiency and design for social equity and cohesion [14]. While the level of consolidation of the first two levels is high and has already permeated design practices, the third level remains inferior and sporadic, and the fourth level has not yet received sufficient research attention, resulting in inadequate implementation in both design practice and education. The implications for design extend to the principles and rules of democracy, human rights and freedom, achievement of peace and security, reduction of poverty and injustice, improved access to information, training and employment, respect for cultural diversity, regional identity and natural biodiversity.

Adding the cultural perspective to sustainable design entails a commitment to fostering wellbeing, cultural diversity and social inclusivity. It also involves strengthening cultural identity, community resilience, and innovation while preserving cultural capital for future generations.

## **4 “SUSTAINABLE MATERIAL SELECTION” PROJECT**

Given the significant influence designers play in shaping every aspect of the built environment, from the materials utilized to the processes of manufacturing and consumption patterns, the importance of educating design students on sustainability cannot be overstated.

Material selection in particular plays a critical role in the pursuit of sustainability. It is considered as one of the most important principles in the DfS approach [15]. The choice of materials directly affects the environmental, economic, social, and cultural dimensions of a product's lifecycle. Selection of sustainable materials extends beyond mere consideration of factors such as resource availability, energy and carbon footprint of the production process, and end-of-life disposal. It requires strategic decision-making that takes into account the context of use, aiming to cultivate environmental awareness among users and potentially create new scenarios for more sustainable lifestyles and consumption patterns within the broader socio-technical system.

The project ‘Sustainable material selection’ was elaborated as a Collaborative Online International Learning project (COIL) with the participation of interior design students from University of Monterrey in Mexico and Oakland Community College in the United States. The virtual exchange format involved students in experiential cross-cultural learning for a duration of five weeks. Launched in 2022, the project was subsequently implemented in 2023 and 2024. Over the course of three consecutive years, a total of 125 students have been engaged in the initiative.

#### 4.1 Project objectives

The objectives of the project were divided into two categories – subject-specific and intercultural. The subject specific objectives were further divided into five categories – define, identify, examine, justify and develop. They focused on acquiring integral competencies in identifying and evaluating sustainable materials, applying sustainable design principles effectively, recognizing the cultural significance of artisanal products, and making informed decisions that contribute to the quality of life, health, and well-being of users in interior design practices. Additionally, the intercultural objectives emphasized creating connections and understanding cultural diversity within design practices. It involves applying culturally respectful decisions, developing intercultural sensitivity and work ethics, fostering positive relationships in diverse groups, enhancing global competence, and broadening perspectives through exposure to international viewpoints and educational systems (Table 1).

Table 1. Project objectives

<b>Subject specific objectives</b>	
Define	- the benefits of incorporating sustainable materials and artisanal products in interior design - the use of traditional handicrafts for establishing sustainable cultural connections and preservation of cultural heritage
Identify	- what constitutes a sustainable material choice - green, sustainable and Fair Trade (GSFT) products for interior design
Examine	- sustainable design principles and strategies for using sustainable materials in interior design practice
Justify	- how the selection of sustainable materials and the integration of artisanal products in interior design can improve the quality of life, health and well-being of the users
Develop	- comprehensive understanding of environmentally responsible materials mindset for eco-conscious design
<b>Intercultural objectives</b>	
- Create connections and discover shared similarities and differences within different cultural and geographical experiences.	
- Apply culturally respectful design decisions.	
- Develop intercultural sensitivity, respect, and work ethics.	
- Foster positive working relationships in a culturally diverse group.	
- Enhance students' global competence, including their ability to adapt to a new cultural context and effectively communicate across cultures.	
- Broaden students' perspectives by exposing them to international viewpoints, alternative solutions to problems, and different educational systems.	

These objectives aimed to provide students with a global perspective on the significance of sustainable practices, to enhance their critical thinking and problem-solving skills and to foster a sense of global responsibility. The COIL project exposed students to diverse perspectives and cultural backgrounds, enriching their understanding of sustainability and material selection in interior design. In this collaboration, students not only developed professional competencies, values, and attitudes preparing them to excel in a global job market, but also had the opportunity to establish friendships that can potentially lead to the creation of cross-border professional networks.

#### 4.2 Project implementation

The project comprised three activities – an intercultural introductory activity, project development, and post-COIL critique and reflection. The intercultural activity titled ‘Cultural sustainability showcase’ served as both an icebreaker and a platform for introducing the topic of sustainability by engaging students in cross-cultural dialogue. Working in intercultural teams, students were tasked with exploring and sharing sustainable design practices from their respective countries. They could focus on historical examples, contemporary projects, or emerging trends in order to discover relevant examples of eco-friendly materials application, energy efficiency, waste reduction etc. The activity concluded with a

discussion and individual reflection on the importance of intercultural collaboration in sustainable design education.

The project ‘Sustainable material selection’ required students to research finishing materials and two artisanal products (furniture/textile/fixture/decorative object, etc.) representing each country to be installed in the kitchen and bathroom of a client located in the US. The analysis began with an exploration of the raw materials used, their extraction, processing, and energy consumption. Subsequently, students investigated the environmental impact throughout the complete material/product life cycle, including transportation, production, installation, maintenance, removal, disposal and opportunities for recycling. To justify why the material/product can be considered sustainable, they evaluated their environmental value and overall eco-efficiency. Additionally, to delve into the social and cultural impact, students conducted a survey to assess how the material embodies sustainable design qualities. Another aspect to explore was the perceptions of individuals from both countries on how the materials and artisan products represent their own culture and that of the opposing country.

The collaboration terminated with a reflection, where the participants contemplated on their journey throughout the COIL experience. Students shared their opinions and described their experiences, providing insights into the project's impact on their perspectives and sustainability practices, challenges faced, criteria prioritized in material selection, skills and knowledge gained and implications of the project's emphasis on sustainable materials within the broader field or industry.

## 5 PROJECT IMPACT AND SIGNIFICANCE

Among the benefits of the project is that it enriches the educational experience by providing students with unique learning opportunities that go beyond traditional classrooms and prepares them in a very effective way for a globalized world. ‘Sustainable Material Selection’ is a formative and educational project. The students who participated developed fundamental skills in selecting sustainable materials, understanding eco-friendly practices, and the principles of the circular economy.

In addition to this profession-specific knowledge, they had the opportunity to learn about other cultures, establish cross-border partnerships and exchange knowledge to achieve sustainability goals in a cross-cultural context. The relationships established between students from the two neighbouring countries facilitated a dynamic exchange of ideas, cultures, and perspectives, providing a valuable learning experience. They became familiar with other cultures, thereby promoting their identity as global citizens who are open-minded and respectful towards the different. Furthermore, the project aligns with various sustainability goals by emphasizing responsible material selection, eco-friendly design, cross-cultural collaboration, and the promotion of sustainable practices in artisanal production, all of which are critical for addressing global challenges and building a more sustainable future (Table 2).

*Table 2. Alignment of Project Goals with Sustainable Development Goals (SDGs)*

SDG	Description
Responsible Consumption and Production (SDG 12)	The project focuses on identifying sustainable materials that incorporate recycled, reclaimed, or locally available resources. This approach encourages responsible consumption by choosing materials with a reduced environmental footprint.
Climate Action (SDG 13)	By researching and selecting materials with lower carbon footprints and sustainable practices, the project supports efforts to mitigate climate change.
Sustainable Cities and Communities (SDG 11)	Sustainable materials, when incorporated into building and design projects, contribute to the development of more sustainable and eco-friendly living spaces, aligning with the goal of creating sustainable cities and communities.
Partnerships for the Goals (SDG 17)	The project encourages international collaboration by incorporating an artisanal element. It promotes cross-border partnerships and knowledge sharing to achieve sustainability objectives.
Circular Economy Principles	The emphasis on materials that are recycled or reclaimed supports the transition to a circular economy, where resources are used efficiently, and waste is minimized.

The conclusion that the ‘Sustainable Materials Selection’ project was beneficial for the students is based on a comprehensive evaluation of the project-related learning outcomes and feedback received from the students. To determine the project effectiveness the following evaluation indicators were implemented – quality of the research, technical proficiency, level of detail, team collaboration, presentation and communication. Firstly, the evaluation of the design outcomes presented by the students revealed the successful application of the knowledge acquired through the project development. Students’ final

submissions reflected a strong focus on sustainability, with the innovative incorporation of sustainable materials into interior spaces. This indicated that the students had internalized sustainability concepts and could creatively apply them in real design contexts.

These observations were confirmed with the positive results obtained in the post-COIL survey. These results underscore the effectiveness of collaborative international learning initiatives in enriching students' education and preparing them to face challenges in an increasingly interconnected world. Students from both countries expressed that they had gained valuable knowledge and skills in the field of sustainability and had experienced significant growth in their ability to collaborate with peers from different cultures. Furthermore, they highlighted that the project had inspired them to consider sustainability and cultural heritage in their future designs and professional careers.

Students shared the following opinions when asked to describe the experience of the COIL project:

*"Honestly, I found it to be a very interesting and interactive project from which I learned a lot. I was excited to meet classmates from another country who are in a completely different environment from ours. They told us about themselves, and we also shared our interests, hobbies, etc. It was challenging because you don't really know the people in your team, but I also learned that communication is key to solving team projects." In my opinion, the COIL project was challenging but rewarding. It opened my eyes to new perspectives on sustainable materials and design practices. While it demanded hard work, collaborating with my international peers was an enriching experience."*

The COIL project demonstrated a clear impact on learning outcomes, as participants improved their understanding of subject-related topics, such as the selection of sustainable materials.

*"Before the project, I had a basic understanding of sustainability. However, focusing on sustainable material selection made me realize the significant environmental impact of material choices and the importance of responsible consumption in everyday life".*

*"We as designers have a really important responsibility when selecting sustainable materials, which I wasn't aware that there are a lot of good options for it, so from now on I will start implementing this type of materials and techniques in future designs and will share it with my classmates".*

*"Before COIL I didn't know a lot of sustainable materials and artifacts and now, I know a lot because of the efforts of my team and from the projects of the other teams".*

Additionally, an assessment of the students' intercultural skills showed significant development throughout the project. Students reported a better understanding of cultural differences and an increased ability to work effectively in international teams. This suggests that the project contributed to their intercultural growth, which is crucial in a globalized world.

*"The most significant experience for me was learning to work with other people, with a culture totally different from ours, and being able to get the work done".*

The project also influenced students' self-perception and cultural identity. During the process, students had the opportunity to reflect on their own cultural identity and how it relates to their personal and professional values in the context of sustainability and design. For many students, this experience led to a greater appreciation of their own cultural heritage and the importance of preserving and promoting sustainable practices rooted in their culture. They understood how traditional materials and artisanal practices from their home countries could play a crucial role in promoting sustainability in interior design. This generated a stronger sense of cultural pride and a deeper connection to their roots.

*"Reading about the cultural history of the artisanal object made me feel very inspired, since it is something we as Mexicans see as something 'ordinary' while it is something unknown for all others that are not from Mexico. Mexican culture and history are one of my favourite things about being a Mexican, I feel very honoured and proud to be a part of this enriched cultural country".*

*"I got inspired looking for the artisanal element because I realized how great it is to find beautiful and at the same time sustainable art for a design. Also, made me fall in love even more with the art and culture of my country".*

Generally, the COIL project on sustainable material selection can be considered as a transformative learning experience. According to the transformative learning theory, transformative learning occurs when individual's frames of reference (the assumptions through which the surrounding world is understood) are effectively changed [16]. It became evident from student' self-reflection that their mindset about sustainability and culture underwent a significant transformation. Firstly, students' perspective on sustainable material selection practices were shifted. Moreover, they demonstrated an increased awareness of their responsibility as designers to preserve cultural heritage and safeguard the environment. Through active participation in intercultural discourse on sustainability, they realized their

ability to make a difference in both their lives and their community. Furthermore, they showed a deeper understanding of the complex character of sustainability practices and its cultural implications. Finally, students became critically reflective on the assumptions about cultural diversity fostering mutual understanding and respect for others. As they went through the challenges of the collaboration, they actively engaged in discourse, critical reasoning and consensus building to collectively make decisions.

## 6 CONCLUSIONS

The project 'Sustainable materials selection' fostered a sense of responsibility toward the environment and cultural heritage. Students benefited significantly from the intercultural and collaborative experience, developing effective communication skills, adaptation to cultural diversity and problem solving related to the selection of sustainable materials in a global context. They developed a commitment to making sustainable and culturally respectful design choices in their future careers. Through intensive research and practical application, they gained a deep understanding of sustainable material selection. They learned to distinguish and analyse eco-friendly materials, understanding their benefits, environmental impacts, and sources. The incorporation of artisanal, handcrafted elements exposed students to diverse cultural practices in sustainable design. They acquired a newfound appreciation for the importance of culture in sustainable material selection. Thus, they were able to recognize their role in contributing to global sustainability efforts. Interactions with international peers improved students' cultural sensitivity and intercultural communication skills. They learned to navigate differences in language, work style, and approaches to design.

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