Chapter 9. Sustainability-Driven User Experience: A Strategic Approach to Interdisciplinary Collaboration

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Abstract. This chapter explores the integration of sustainability within user experience (UX) education, emphasizing the role of interdisciplinary collaborations. Drawing on author's experiences with Project Cities and EPIC (Educational Partnerships for Innovation in Communities), the chapter illustrates how these initiatives facilitate practical, community-engaged learning experiences. By detailing specific classroom practices, it underscores the necessity of adaptability in course structures and the profound impacts on student engagement. Educators are offered valuable strategies for embedding sustainability in UX curricula, fostering a learning environment that is meaningful, impactful, and relevant to current societal challenges.

In exploring ways to enrich user experience (UX) education, scholars have a unique opportunity to initiate collaborative projects with diverse disciplines and community organizations.[1] Such partnerships contribute to the development of comprehensive UX courses, fostering a deep understanding of UX principles among students and preparing them for collaborative endeavors in their future careers. User experience, as defined by Norman & Nielsen, encompasses all facets of the end-user's interaction with a company, its services, and its products, highlighting the multidimensional nature of UX. This case study underscores sustainability as a particularly fruitful area for multidisciplinary collaborations, demonstrating the potential for positive impact and innovation.

First, sustainability is inherently interdisciplinary because its problems are "too new, complex, wicked, hybrid, or too risky" to be resolved by an individual discipline (Schmidt, 2008, p. 58) and because human societies and ecological systems are very interconnected and co-adaptive (Dale & Newman, 2005). Second, sustainability has gained prominence in both Human-Computer Interaction (HCI) and UX, areas that are closely linked: HCI, often considered a precursor to UX in academic research, shares common ground with UX, particularly in terms of research focus and methodologies. This intersection has given rise to Sustainable Interaction Design (Blevis, 2007), emphasized the need to integrate sustainability goals into user-centered design processes (DiSalvo et al., 2010;

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Goodman, 2009; Mankoff et al., 2007; Raghavan & Pargman, 2017; Silberman et al., 2014), and highlighted the value of learning from other design-focused fields like architecture (Shamonsky, 2018). Furthermore, it has led to the development of specific strategies for incorporating sustainability into design practices (Frick, 2016; Kramer, 2012; Meier et al., 2011). Third, sustainability has become an important learning outcome in higher education. The United Nations Education, Scientific, and Cultural Organization (UNESCO) has been advancing Education for Sustainable Development since 1992 (UNESCO, 2017). More and more universities, recognizing the need to promote sustainability education, include sustainability into their mission statements and learning outcomes (Zhan et al., 2015). For some degree programs, like engineering, accreditation criteria now include sustainability-related elements. For example, the criteria of the Accreditation Board for Engineering and Technology (ABET) state that student outcomes already at the baccalaureate level need to include "an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability" (ABET, 2015, p. 3).

While sustainability clearly provides opportunities to serve as an organic site for UX collaborations in educational contexts, how can instructors incorporate it as a focus in UX classes? In what follows I describe a case study that provides one answer to this question.

Context of the Collaboration and Collaborators Involved

In the fall semester of 2017, two of my classes conducted a project that focused on redesigning a community website with an eye toward sustainability. The two classes, named User Experience and aiming at guiding students through a typical UX project, enrolled 15 graduate and 22 undergraduate students with majors ranging from technical communication to engineering (e.g., graphic information technology and human systems engineering) to design. The learning objectives of the classes were to introduce students to the principles, techniques, and tools of UX design and teach them how to approach a UX design problem holistically. Combining theoretical analysis and hands-on learning, the assignments in the two classes included researching potential and current users, with their contexts, goals, and tasks and analyzing the results of this research; planning user-focused redesigns of the website and creating such redesigns as click-through prototypes; and evaluating the effectiveness of the redesigns. The deliverables included research reports (personas, tasks, and scenarios; findings; redesign recommendations) and prototypes with evaluation plans and ROI arguments.

The project was part of the *Educational Partnerships for Innovation in Communities (EPIC) Network*, a coalition of 30+ universities that partner with local communities to catalyze improvements in places we live in (Educational Partnerships for Innovation in Communities Network, 2017). EPIC argues that most

sustainability issues happen at the community level. Yet, communities often lack time, resources, and political space to do things in new ways, so EPIC helps communities to put knowledge to practice by tapping into a local university's expertise: EPIC aims at matching local communities and universities in ways that advance the needs and benefits of both, all the while engaging with existing administrative structures. The EPIC program at ASU, Project Cities, carries out the mission of improving environmental, economic, and social balance in local communities and each year connects several classes with one or several local communities.

During the 2017–2018 academic year, Project Cities worked with the community of a town located 30 miles from ASU and surrounded by beautiful nature and historical sites; the community had experienced economic hardships in previous years but was rebuilding itself to improve its perceptions, vitality, and environmental approaches. Several classes took part in Project Cities at that time: User Experience, Landscape Design, Tourism Planning, Sustainable Solid Waste Management, Public Affairs Capstone, Socio-Economic Planning, History of the Wild, Projects/Community Based Theatre, and Planning for Sustainable Communities. The nine classes worked on four structured sustainability goals identified by the community stakeholders: improving the perceptions of the community and its sustainability, finding and promoting better ways of solid waste disposal, understanding homelessness, and planning and designing a space for an off-leash dog park. My UX classes specifically focused on community perceptions and sustainability as represented in the website for visitors and addressed the following goals determined through discussions with the community: identifying key audiences and stakeholders and better understanding their perceptions about the community; determining the strengths, weaknesses, and assets of the community; and exploring alternative and additional opportunities for existing programs.

EPIC through the Project Cities program had a tremendous impact on the success of the UX classes. Two dedicated Project Cities coordinators created liaisons between the community and the classes. These coordinators fulfilled multiple project management roles, from soliciting a proposal from the community and leading the negotiations about the goals and outcomes for all involved to drafting the memorandum of understanding between community, faculty, and students and organizing milestone events (e.g., introductions and visit to the community, final presentations, etc.). Once the projects were complete, the coordinators engaged a graduate assistant to create the final report based on community goals that combined the work of all classes.

Challenges of the Project

Although almost all products and services typically have touchpoints with sustainability, including it as a focus of the UX classes faced two major challenges. First, defining the term "sustainability" is fraught with disagreements. The foundational and most cited definition of sustainability appeared in the Brundtland

Report and included three dimensions: environmental, social, and economic; these dimensions aim at development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UN, 1987). Over the years, this definition, however, received substantial criticism due to its unclear distinction between the three original dimensions and to excluding such possible dimensions as, for example, diversity, cultural vitality, and education. As a result, in 2015, the UN adopted a sustainable development agenda that included 17 large-scale interlinked goals (UN, 2015).[2]

Second, although the fields of UX and HCI agree on the importance of making sustainability a goal for research and practice, there are contradictions in what that means. Most agree that considering sustainability includes two main directions: decreasing the environmental impacts of interactions with technology and improving sustainability in other areas through design, e.g., by influencing eco-friendly lifestyles (Mankoff et al., 2007; Raghavan & Pargman, 2017). Yet, for example, whether decreasing energy consumption of developing digital information products and the resulting user interactions is an impactful endeavor is open for discussion. On the one hand, information technologies produce about 14 percent of total emissions if indirect energy is included in the calculations (*Belkhir & Elmeligi, 2018*). On the other hand, the footprint of computing constitutes only two percent of global energy use and efficiency gains can disappear due to rebound effects, e.g., Jevons's paradox (Hakansson & Finnveden, 2015; Jevons, 1906; Raghavan & Pargman, 2017; van Heddeghem et al., 2014). In addition, while some argue that "in the case of sustainable UX, people-friendly is also more planet-friendly" (Frick, 2016), others see the potential of sustainability goals being at odds with user-centeredness: "If we think of observing users and using this as the 'rightness' to infuse into design processes, we need to fully understand if and when what we observe are in fact sustainable actions" (Kramer, 2012). In such a way, users might actually need to be persuaded to act sustainably (DiSalvo et al., 2010).

Results of the Collaboration

To address the challenge of defining sustainability and determining its implications for UX, I introduced sustainability as a design challenge: How can we add sustainability goals when engaging in UX-focused website redesign?

Following Ann Dale and Lenore Newman (2005), who considered meaningful all-encompassing definitions neither possible nor useful in dealing with complex systems such as sustainability, I did not provide students with a single

2. No poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation, and infrastructure; reduced inequality; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; partnerships to achieve the goals.

definition of sustainability. Instead, I challenged them to compare the definitions from the Brundtland Report with the UN's large-scale goals, while also analyzing several short readings discussing the controversies of sustainability in HCI. As a result, students learned to see the purposeful ambiguity in defining sustainability as a productive arena for discussing the often-overwhelming sustainability goals in a specific context of a specific community with tangible, unique challenges: to tailor their own definition to "achieve concrete goals in their unique situation given the constraints of institutional history, existing frameworks, and structural and financial limitations" (Dale & Newman, 2005, p. 354). For example, using the UN goals to examine community needs and challenges, students combined the goals of creating resilient communities with economic growth and goals related to decreasing energy consumption and preventing pollution. As a result, they focused on conservation of resources (energy, finances, time) and user behaviors (recycling, free time activities).

Working on this design challenge, in addition to user and context research (content audit, comparative analysis, interview, survey, card sort, and usability testing), students communicated with community partners, with students of different majors in the UX classes, with students from other classes, and with Project Cities coordinators. They recruited and worked with users that reflected personas developed based on descriptions provided by the community (users for in-person testing were recruited from students' personal circles; users for remote testing were recruited through the educational partnership with TryMyUI). As a result, they worked on the following intersections of sustainability and UX throughout both their research and redesign projects:

- *Including sustainability into research*. Students argued that an effective approach to encouraging sustainable behavior is focusing parts of user research on sustainability, for example, including sustainability-related questions into surveys or interviews.
- *Developing personas, tasks, and scenarios.* Based on the results of their research, students included sustainability-related needs and goals into their personas, tasks, and scenarios (e.g., an environmentally conscious day hiker).
- *Including sustainability into content strategy*. Students started their projects with content audits and comparative analyses. For comparison, they selected the websites of communities that actively promote sustainable lifestyles during comparative analyses. Getting to know the content and information architecture of the website during content audits, students then suggested additional content about green tourism, garbage disposal, and recycling (which they could later adjust based on information from the tourism planning and waste management classes).
- *Uncovering inefficient design elements.* Students specifically tested the importance and usability of such website elements as an introductory video and a downloadable high-resolution information brochure because both

require more battery power for viewing. While the short video proved "fun" while only somewhat helpful, users typically tried to avoid downloading the PDF booklets, particularly on mobile devices.

- *Uncovering ineffective content.* Attracting visitors to the city through its website became an important part of both economic and social sustainability focus. It involved making the website attractive and easy-to-use. Based on content audits and user and stakeholder (e.g., current residents, business owners) research and thanks to feedback from other classes (e.g., tourism planning), students identified content that had little relevance for visitors or was ineffective.
- *Improving navigation and findability.* Students argued that navigation and findability are important factors for economic sustainability that also have the potential to preserve energy. Students focused on first testing navigation labels and then performing card sorts to determine the most intuitive navigational structures. Based on the results of the content audit and other user-research methods (e.g., interviews, observations), they also included content that was not on the website originally but was mentioned by most research participants (e.g., lodging). Including such content allowed users to find information quickly without having to leave the city's website. Based on the results of card sorts, user interviews, and conversations with community partners, students also suggested including quick filtering options for common searches, for example, family-friendly restaurants, dog-friendly hotels, outdoor activities for seniors, etc. Yet another element to improve findability was a filterable calendar of events.
- *Recommending a web Content Management System (CMS).* Because community partners wanted to make website design and upkeep more streamlined to save time and resources (and energy), students suggested switching from outsourcing website design to using in-house resources and talent and a web CMS. As a result, students included recommendations about web CMSs in their research findings.

While not each student engaged with every intersection of sustainability and UX described above due to the unique directions their projects pursued, they became familiar with these intersections through peer-review. As a result, they considered sustainable development as "a constantly moving target whose boundary domains evolve" (Dale & Newman, 2005)—just as the connection of UX and sustainability does.

Practical Implications

This project illustrated that sustainability can be a productive site for interdisciplinary UX collaborations, especially when students are encouraged to freely explore its meaning and relevance.

In the case study I describe, students got experience of working with a variety of stakeholders and disciplines, thus learning how to present the value of UX work. Including sustainability as a UX focus helped establish UX as a key stakeholder of the overall project, showing students that sustainability in UX is an exciting niche and an opportunity to showcase UX as a decision driver.

What is more, students learned how to engage with the definitions of sustainability productively and see possible connections of the pillars of sustainability (e.g., including green tourism and deleting a PDF brochure having both environmental and economic impacts). Understanding sustainability broadly is particularly beneficial in interdisciplinary contexts, where more space for various stakeholders to work toward a unique and constructive dialogue is necessary (Dale, 2001). In addition, students practiced how to address UX- and HCI-specific contradictions in sustainability work (e.g., focusing on green tourism as a means of persuasion). The project also helped them see traditional UX questions from the sustainability perspective (e.g., the value of good navigation in making a website intuitive, attractive, empowering—and energy efficient).

Focusing on sustainability in a UX class project helped crystallize two important practical implications for educators:

- *Search for existing collaborative infrastructures on your campus and nationally.* Sustainability is a topic for which one can often find existing *programs*. Its comprehensiveness can allow educators to leverage teaching partners on campus with already existing community connections and tap into the extensive infrastructure sponsored by EPIC. As a result, students in my courses benefited from a clear structure in communicating with the community, support network of Project Cities, connections to students in courses from a variety of disciplines, and opportunities to showcase their work within the university. Community partners benefited from the continuous nature of the project, with several new courses picking up the baton in the following semesters. I as a faculty member benefitted from establishing connections within the cross-disciplinary academic team and gaining visibility for the UX program. In addition, receiving the infrastructural support frees up faculty time and can allow the faculty member to be more experimental with class formats. Both classes I described were conducted in an intensive online format, which can make any faculty member shy away from collaborative, community-engaged projects due to time commitments, yet it proved to be a viable option in this case (Batova, 2021).
- *Be flexible with the elements of the course structure*. To ensure the success of your course, it is crucial to maintain flexibility in the course structure. Encourage open discussions with your students about the dynamic nature of the project and be prepared to adapt various elements of the course, such as communication channels and deliverables. You might consider

incorporating methodologies like lean UX, which allows for iterative testing and pivoting throughout the project. For example, based on the lean UX methodology, I decided on weekly units that focused on testing specific hypotheses that provided student teams multiple opportunities to adjust their work (Batova, 2021). When faced with challenges such as online communication with community partners or time constraints, promoting a structured team approach can enhance project management and ensure smoother collaboration. Even if certain outcomes, like clickable prototypes, are not required in the final deliverables, guide your students to compile and present their work in a manner that is accessible and useful to the recipients. The positive feedback from the community partners justified the flexibility-focused approach: research-driven recommendations and prototypes allowed them to allocate resources to the website redesign.

It is important to note that students' engagement in the two UX classes was very high; many of them commented on feeling that they can impact real change in a project that addresses one of the key issues our society faces today. Although graduate students were somewhat better equipped for the amount of work in the classes, the project appealed to all students, confirming that current cohorts of students are highly concerned about and willing to engage in sustainable behaviors (Fullerton et al., 2019; Petro, 2020).

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