

**VentureWell Sustainable Design Faculty Grant Proposal:
Inventing Sustainable Apparel: Experimentation to Entrepreneurship
ArtCenter College of Design — May 2021**

Context/Introduction

The "fast fashion" phenomenon—mass-producing clothing that quickly becomes outdated—is destroying the planet. More than 60 percent of modern fabric fibers are made from synthetic materials that do not decay when they end up in landfills or oceans (New York Times, 2019). McKinsey (2020) noted that consumers increasingly expect apparel to be sustainable and concluded that "circular business models won't be optional" in the decade to come. But how can students learn how designers and materials scientists work together to create apparel that is both sustainable and commercially viable?

Inventing Sustainable Apparel: Experimentation to Entrepreneurship (working title) is a new course that will fuse wearable invention, materials science, and entrepreneurship—viewing them all through the lens of sustainability. It will pay special attention to fast fashion as an area of potential for environmental impact, inspired in part by pioneering research by the [Ellen MacArthur Foundation](#) and its "Make Fashion Circular" initiative. Taking advantage of newly built science lab and sewing facilities on campus, the course will provide experiential learning opportunities for students to explore nuances of material choices by manually fabricating prototypes. Students additionally will learn about the role digital technologies play in the fashion industry, from production to customer journey and marketing.

The goals of this project are to: (1) pilot a new course combining sustainability, entrepreneurship, and materials science with hands-on making opportunities; and (2) use this class to expand the existing campus entrepreneurial ecosystem and bridge it with the new Minor in Materials Science.

Proposed Initiative

What this adds to what exists: ArtCenter has a long history of teaching the design/invention of *wearable technologies and wearable goods, entrepreneurship, and sustainability*. What is new is *materials science*—which has exciting educational implications for all of these topics. The College is launching a new Minor in Materials Science, in conjunction with the opening of the new W. M. Keck Science Lab, funded by the W. M. Keck Foundation. This proposed new class will serve as the first attempt to bridge these multiple topics, challenging students to invent sustainable new forms of apparel that have legitimate market potential. The faculty strongly believe that *sustainable fashion* is an extremely timely niche in industry that must be taught. (The Keck Science Lab is fully built and ready for use when post-pandemic conditions allow for resuming in-person classes on campus. It is strategically located adjacent to ArtCenter's newly expanded Sewing & Wearable Goods Lab. These two facilities are complemented by the Color, Materials and Trends Exploration Laboratory [CMTEL] which serves as both a library of material samples and as a studio classroom—see Appendix.) As partial early preparation for this course, the lead faculty collaborated in teaching a course in "future knits" and the PI conducted some material research on various types of yarns (see Appendix).

This course will serve as a feeder of student teams into an existing entrepreneurship curricular pathway we have built with prior VentureWell support. This includes Intro to Circular Entrepreneurship, the pre-capstone Launch Prep class, and the capstone Launch Lab class.

Educational, environmental, and social impact: The lead faculty believe material innovation—specifically in the context of materials made from sustainable, recycled content—has the potential for huge impact at scaled production. Student invention will focus on new types of garments made of cutting-edge, rapidly biodegradable materials such as (but not limited to) those made from food waste. Anticipating that fast fashion is unlikely to subside in the coming years, students will be challenged to devise sustainable mitigations (e.g., garments that intentionally have a shorter shelf life and are disposable/compostable, or garments that are designed to be easy to recycle).

As preparation, the students will survey systems of production, different business models, and the current marketplace of products and services. For business and market context, students will be urged to study the Ellen MacArthur Foundation's extensive [analyses of the fashion industry's relationship to the circular economy](#) and [H&M Group's](#) sample approach to applying sustainability principles in to corporate business practices.

Scientific learning will be integral. For example, a materials science lecture on polymers will be combined with an in-class lab on creating polymers. The same week, students also will learn about cellulose, a natural polymer derived from wood pulp that is prevalent in the textile industry, and its potential role in circular product design through fabrics such as Tencel and Lyocell. Their homework assignment for the week may be to create a material or surface treatment using cellulose fibers and imagine design applications for that material. The science behind processes of decomposition and recycling also will be presented.

Students additionally will learn about the potential future roles of digital technologies. McKinsey (2020), citing H&M Group's influential sustainability studies, noted that *"the future of fashion is both circular and digital."* For example, embedded technologies may make garments easier to track for resale, rental, and recycling—capitalizing on the emerging concept of "digital wardrobes." The role of digital technology will be emphasized at the system level of the fashion industry: RFID tracking for supply chain management; communication and visualization software that allows for global production and distribution; social media as a social force driving increasing consumption (and waste) of fashion. Digital and emerging technologies (including mobile apps, tracking technologies, e-commerce, communication and display technologies and augmented reality) will be surveyed in relation to wearables/fashion, and may be included in final project concepts. The PI's primary expertise is in wearable technologies, making her well equipped to teach this aspect of the curriculum.

The topic of sustainable garments also provides a great opportunity to educate students about the context of climate change. The Ellen MacArthur Foundation (2017) projected that the textile industry is on track for disproportionately "catastrophic outcomes" for global climate change: "If the industry continues on its current path, by 2050, it could use more than 26% of the carbon budget associated with a 2°C pathway."

Sustainability curricular content: In addition to material choices, the course will introduce students to concepts of supply chain, product use and end-of-life. Students will be required to consider a series of questions for each of these areas. VentureWell's Inventing Green toolkit will be a key resource. In general, students will be guided to think beyond a single product and instead understand the systems and cycles (e.g., Life Cycle Analysis) that their product idea potentially involves.

Examples from VentureWell's "Tools for Design and Sustainability" resource collection also will be shared with students and discussed. General concepts such as designing for a circular economy and developing greener materials will be contextualized with the subject matter (e.g., considering the human factors in the fast fashion industry, and the types "circular customer journeys" that may be unique to fashion). These will be supplemented with other sustainability components of the curriculum tailored to material experimentation and consumer product design (e.g., "What are the most sustainable fabrics currently on the market, and why?").

Ultimately, the class will focus on guiding students in understanding their own impact as inventors and designers. An overwhelming amount of non-biodegradable material waste from human consumption arises from consumer products that have been created by designers. Next-generation industrial design is a crucial focus for implementing real-world changes in sustainable practices.

Target audiences: The course is for undergraduates of all majors, skewing toward students who are at least mid-way through their progress toward graduation. *ArtCenter increasingly is a school that helps*

women enter the workforce. Its incoming undergraduate class in fall 2020 was 62% female, up from 49% a decade ago.

Plans and activities for inclusion of URGs: The faculty anticipate that the “fast fashion” topic will resonate with a more diverse selection of students than a traditional STEM class or more typical consumer product-focused class might at the same time it gives them added skills for becoming business leaders in the industry, where women and minorities are still notably underrepresented. The course will be co-taught by two women faculty members who can also serve as potential mentors: a technologist (wearable product specialist) and a materials scientist.

ArtCenter has a new Center for Diversity, Equity and Inclusion (DEI) in Art and Design, led by the Chief Diversity Officer. The College is also launching a DEI Action Plan to increase recruitment and retention of underrepresented students in all areas of the College, with an eye toward tailoring efforts to meet the needs of specialized niches such as entrepreneurship. The Plan also includes a complete rethinking of how curricula are conceived, and has arrangements for related inclusivity training to be spearheaded by ArtCenter’s Director of Faculty Development, Teaching & Learning.

This course will include historical textile and fashion development through feminist lens, Indigenous materials and methods, and readings from (and research in) the Fashion and Race Database. The faculty will address issues of accessibility, socioeconomic inequality, and labor in their analysis of the global fashion industry. Visiting lecturers and guest speakers will be chosen to further enhance the inclusivity of the curriculum, leaning toward women and underrepresented minorities.

In collaboration with the DEI Center, the course will be internally promoted and marketed on campus through a variety of means in the trimester term preceding the class launch. There also will be an “information session” (presented in-person and/or via Zoom) where the faculty will pitch the class to potentially interested students, and students from underrepresented groups especially will be targeted to receive invitations to attend the session. Colorful, hard-copy posters will be placed throughout ArtCenter’s two campus locations. Digital versions of the class posters will be run on ArtCenter’s system of informational video monitors through the campuses, as well as on InsideTV, the College’s intranet channel providing the same content.

As ArtCenter is a small college with intentionally small class sizes (10-15 students), and as its renewed diversity practices are still being launched, we do not yet have required diversity metrics for individual small classes. However, the faculty for this class are aiming for enrollment of at least 70% women and at least 40% from other underrepresented minority groups. Diversity and equity must intersect with sustainability to truly address the fast fashion crisis.

E-Team formation and idea generation: In the beginning, the faculty will provide general subject parameters and suggest opportunities for innovation. Students will be challenged to devise concepts that advance sustainable fashion in a new way and also have market potential.

Because designers in industry regularly must work in cross-disciplinary teams, ArtCenter already requires team-based projects in its curriculum. After preliminary immersion in the subject matter, students will be organized organically into teams based on complementary skill sets and interests. Students will generate their own ideas and have ownership of the resulting IP. (Intellectual property also will be briefly touched upon during the course.) As the teams develop their projects, the faculty and experts/advisors will help the student teams to identify the appropriate skill sets and expertise they will ultimately need to create well-rounded E-Teams capable of launching viable startups.

Design and development will be refined through successive iteration over the weeks, driven by design critique as well as analysis, testing and user feedback of low- to mid-fidelity prototypes. The ArtCenter design studio methodology of iteration mirrors strategies from the startup/entrepreneurship realm: multiple cycles of iteration, testing and analysis.

Through their making and prototyping, students will discover potential customers, and insight into product-market fit. Exploring the customer perspective allows for natural opportunities for students to consider basic questions about the viability of a product idea: What is the distinguishing product value for the customer? What is the existing marketplace of comparable products and how does this new concept stand out? What are the production considerations? Ultimately, the questions will guide students toward understanding the fundamentals that inform the development of a business plan.

Students will also craft the narrative of their concept, as early preparation for pitching ideas to potential backers. Through an interaction and user experience design lens, they will consider relevant digital technologies and branding strategies that can change consumers' relationship to fast fashion. As Xevi Gallego, designer of the identity for MycoWorks, a mycelium-leather startup (see Appendix), notes, "It is not only what we are doing, it is also how you talk about it. When you are introducing something completely new to the world, strategic storytelling is essential to reach people and to form a personal connection."

Experiential learning: Design schools by their nature prioritize hands-on making and prototyping activities. The course will continue that tradition, giving students opportunities to try their hand at sewing and to experience making some sample materials in the lab. The tactile quality of fabrics and textiles makes them an especially appealing subject for hands-on learning.

Team & Partners

- **Elise Co (P.I.)**, ArtCenter faculty member in Media Design Practices and a MIT Media Lab alum, is an expert in wearable technologies (physical interactions and materiality) and will serve as the co-lead instructor for the course.
- **Rita Blaik, PhD**, ArtCenter faculty member in Humanities & Sciences, is a materials scientist overseeing the new Minor in Materials Science; she will guide the science-focused aspects of the curriculum and serve as co-lead instructor.
- **Mateo Neri**, entrepreneur and ArtCenter entrepreneurship faculty member, has particular expertise in sustainable fashion, and will advise on the entrepreneurship and technical aspects of the course. He also will coach the P.I. from his own experiences as a successful recipient of multiple past VentureWell Faculty Grants.
- **Robbie Nock**, ArtCenter's Director of Entrepreneurship and Professional Practice and a past VentureWell grantee, will help teams navigate the array of entrepreneurship resources on campus.
- **Jane McFadden, PhD**, Chair of Humanities & Sciences and a past VentureWell grantee, will help oversee the course development and ensure its integration with the department's science curriculum.
- **The Center for Diversity, Equity and Inclusion in Art and Design** at ArtCenter, led by Chief Diversity Officer **Aaron Bruce, PhD**, has a team of staff who will help to guide department chairs and faculty across campus in making their classes as inclusive as possible.
- **Justine Parish**, ArtCenter faculty member, director of the Sewing & Wearable Goods Lab and a fashion designer, will advise on sewing and aspects of the fashion industry.
- **Ben Borden**, ArtCenter faculty member, a materials and fabrication expert, will advise on experimenting with new materials in product use.

Entrepreneurial Ecosystem

ArtCenter's small size (approx. 2,100 students) and favorable 8:1 student/faculty ratio enable highly individualized attention to students' needs. Faculty and staff serve as matchmakers between students and an array of available entrepreneurship resources. In particular, Robbie Nock, Director of Entrepreneurship and Professional Practice, serves as a campus-wide student advisor and helps to channel teams into the appropriate classes.

The most promising teams arising from the course will be encouraged to continue into the aforementioned pre-capstone **Launch Prep** and/or capstone **Launch Lab** courses, in which students with technology-based product concepts gain more in-depth business training en route to forming startup entities or joining external incubators or accelerators. These Launch courses are now being supplemented by a new **Business Minor** which offers additional elective courses. Students interested in a deeper dive into "green inventing" will have the option of subsequently taking the **Intro to Circular Entrepreneurship** class (which also can serve as a feeder into this new course). The instructors of all the main entrepreneurship classes (Intro to Circular Entrepreneurship, Launch Prep, Launch Lab) are serving as advisors to the development of this course, to ensure students' smoothest possible transition to or from this course.

This new course also will raise students' awareness of the **VentureWell E-Team** Stage 1 and Stage 2 opportunities. Unlike at many other colleges, ArtCenter student teams receive personalized coaching on E-Team proposals. An ad hoc support team — typically consisting of the Principal Investigator faculty member, the Director of Entrepreneurship and Professional Practice, and the campus Foundation Relations director — comes together to guide each team through the VentureWell application process and provide feedback on proposal drafts. Last fall, despite the challenges of COVID-19, ArtCenter achieved a notable success story. The women-led "I'MNOT" team of Product Design students Peggy Li and Skye Lou won a VentureWell E-Team Stage 1 grant amid an extremely competitive national applicant pool.

Work Plan

Fall 2021:

- Faculty attend Green Launchpad Educators Workshop and Community of Practice meetings
- Faculty attend advanced textile expo (Industrial Fabrics Association International or other) to research current materials

Spring-Summer 2022:

- Faculty continue course preparation
- Faculty pilot a small-group student studio (not a full-term class; 3-5 students) to test and develop hands-on processes

Fall 2022:

- Commence first iteration of the class (10-16 students in 4-6 teams)
- Most promising teams continue into ArtCenter's Intro to Circular Entrepreneurship or Launch Prep course and/or coached on applying for E-Team Stage 1 grants
- Faculty and department chair review outcomes and adjust curriculum and/or roster of experts/advisors if needed

Spring 2023:

- Commence second iteration of the class (10-16 students in 4-6 teams)

- Most promising teams continue into ArtCenter’s Intro to Circular Entrepreneurship or Launch Prep course and/or coached on applying for E-Team Stage 1 grants
- Faculty and department chair review outcomes and adjust curriculum and/or roster of experts/advisors if needed
- Faculty attend VentureWell OPEN conference to share lessons learned

Outcomes

Personal, student, and institutional outcomes: Institutionally, this interdisciplinary class will help to ensure that major initiatives and subject areas of the College—design, entrepreneurship, new science curriculum/lab, diversity—are not carried out in educational silos. Ultimately we aim to equip students with knowledge on a most timely subject that has potential to shape careers—and save the planet.

Success definition: We will be successful if/when...

- Students understand the breadth of systems that comprise the fashion industry
- Students understand and can mediate the consumer forces at play in fast fashion
- Students are able to connect materials science to hands-on material processes

Another gauge for assessment will be the number and gender/diversity of students participating in the course and the numbers that continue into Intro to Circular Entrepreneurship or Launch Prep. In addition, the faculty will look to see achievement of learning outcomes related to sustainability, materials science, and entrepreneurship. At the institutional level, the educational leadership will consider this successful if the curricular aspects are deemed worthy of replication in future courses, whether iterations of the same course or adapted into other new or existing courses.

Tangible work product: The faculty will create a PDF course summary to share lessons learned from the course pilot with peer educators via VentureWell’s network. This may include information about:

- Collective studio Material Library including physical samples, process specification, and documentation of properties;
- Sample student prototypes of wearable goods (garment, accessory, or component); and
- Sample student conceptualizations of potential customers and market opportunities, and initial conclusions about what gaps they need to address to start formulating a business plan.

Continuation, Replicability, Sustainability: Product design/invention, sustainability, and entrepreneurship are core topics at ArtCenter. With the opening of the W. M. Keck Science Lab, science will grow as another core topic. As ArtCenter expands its Materials Science Minor, this course and the learnings from its pilot phase will be essential for integrating science learning with sustainability and entrepreneurship. Entrepreneurship is especially central: ArtCenter's Board of Trustees includes 16 entrepreneurs (more than half of the Board) who have started their own businesses. Entrepreneurship resonates deeply with the College's leadership and will remain a core subject taught at the institution.

If, as expected, the model for the class achieves proof of concept by the end of the pilot period, it will become incorporated into the College's annual operating budget. We thank you for considering this proposal.