Circular Design with Cotton in a Digital Age

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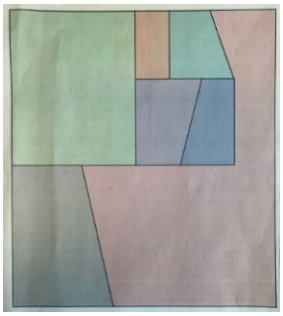
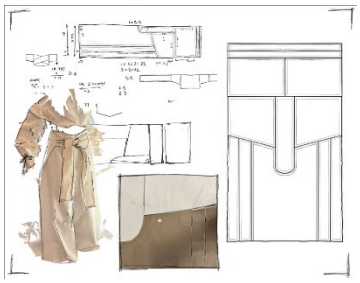
The apparel industry is a complex system involving materials, people, and manufacturing that impacts our environment differently in each phase of the process. To develop impactful future designers, educational objectives should progress beyond replication to understand how to apply and synthesize these to create original ideas. (Anderson & Krathwohl, 2001) This thinking led to the development of an applied project for a Junior-level design studio class incorporating research, Clo 3d, zero-waste patternmaking, cotton education, and an end-of life decomposition study. Cotton is an important natural fiber for comfort, aesthetic, and sustainability reasons, and zero-waste patternmaking has been established as an effective design challenge (Hall & Orzada, 2014), as well as an ideal way to connect digital patternmaking with creative design. (McQuillan, 2020 Circularity and end of life impact would be explored by burying the garments for several months, then un-earthing them to evaluate the decomposition process on the textiles and notions. To fund the project, an external grant was secured to purchase supplies and fund awards.

Fifty-nine junior design students participated, with three instructors across three sections of the class involved. The project was executed in the spring semester, with the burial part of the project conducted through the summer and fall, and final presentations submitted for review and awards consideration in November. To encourage student participation beyond the grading period of the class, three monetary awards were negotiated in the grant. The materials purchased were top and bottom weight cotton fabrics in knit and woven structures selected by the instructor; these were chosen in natural or white to give students a blank canvas to manipulate.

When the project was introduced, students were excited about the sustainable focus and provided fabric and supplies; once it was announced we would be burying the garments after they were constructed, some resistance allowed us to discuss what will happen to the garments they will participate in designing, producing, and introducing into the environment in their future careers. To provide a foundation to the project before designing, students were teamed up to conduct research on the social impact of cotton, sustainability and circularity in relation to cotton, and zero-waste pattern design. This led to vibrant discussion about each topic, such as the burden of sustainability on this generation of designers and the problematic history of cotton production in the United States, and it was an important step in the design research phase. After this research, students were given creative freedom to choose inspiration, and target customer. To practice zero-waste design a paper exercise was held in class; the pattern was then imported into Clo 3D and the instructor demonstrated how to work through finessing this zero-waste pattern. This design development demo was edited and used to make a garment in 100% Polyester to use in comparison to the cotton garments in the burying phase. After this zero-waste exercise, students were tasked to experiment with zero-waste design using half-scale iteration, Clo 3d and digital fabrics.





Zero-waste exercise (top) & student work (below)

Along with design development, the fabric choices were discussed and each student was required to design and resolve the zero-waste patternmaking for their design to two fabric options. This meant they had to resolve the same design with two different fabric widths. The students then proposed their final designs and fabrics for instructor approval, and fabric was distributed. Many students embraced the project and considered how to contribute to circular design through zero-waste patternmaking and decomposition, such as embedding seeds for both vegetables and flowers to give back to the earth. To transform the plain white or un-dyed fabric, students used a variety of treatments including synthetic and natural dyes, quilting, knitting, and pleating. Upon completion of the project, students presented their work in class and turned in their garments.

Burying the garments

Decomposed garments

Once all garments were collected, they were buried. An excavator was used to dig two large holes in the ground where the garments could be placed and buried. Before filling in each hole and covering the garments, photos were taken to document the placement of each garment and accompanying designer. The garments remained in the ground for over five months and dug up using the excavator. The clayey soil contributed to a decomposition that maintained the form of the textile but melded it into the clay itself, while the folded areas of garments were much less degraded than the single layers in the ground. Many students dyed their fabrics; the synthetic dyes held up better than natural dyes but were still altered and, in many cases, bled onto the surrounding soil. Students made their own notions and closure choices, and some of the embellishments, buttons, zippers, and polyester threads were completely unchanged other than being dirty. Along with this, the polyester garment was stained but completely intact.

Students were notified when the garments were un-earthed and ready for pick up and given instructions for submitting a final report to be considered for the three awards. The students were encouraged to include their observations from a practical and sustainable perspective as well as their perspective and feelings about the entire process through a conceptual, emotional lens. Out of the 59 students who participated in the project in class, 40 returned after class to pick up their garment, and 10 students submitted a final project. These projects were juried by the upper-level design faculty, and the three winners chosen. In their final reflective reports, students recognized how harmful mixed fibers and treatments were for the environment when applied to cotton garments. They noticed the polyester threads remained intact, and how garments decomposed in relation to polyester zippers. The project made students consider sustainability and the impact of textiles on the environment in a direct way, and how choices made in the design process both contribute or discourage a circular

Polyester garment pre-burial & post-burial

economy. This was the first attempt to conduct a project like this, and it involved many moving parts, several instructors, several class sections of students, and it was at times difficult to navigate and manage. However, the outcomes and impacts from each step of the process were extremely rewarding as students were challenged to think more deeply through this applied project.

References

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