

PinaClutch-No Waste!

Zahra Falsafi, Iowa State University, USA

Mentor: Rachel J. Eike, Ph.D., Iowa State University

Keywords: material diversity, zero-waste pattern cutting, sustainability, accessory
The fashion industry, is currently valued at \$3 trillion and employs roughly 3.3 million individuals (Fashion United, 2022). When looking specifically at textile fiber production within the fashion industry, textile agriculture employs about 4% of the world's population (Towsead & Sette, 2016). Textile fiber production, which includes textile agriculture for the development of natural fibers, such as cotton and wool, and the chemical fiber industry, which includes production processes for man-made fibers such as polyester and nylon, is expected to reach nearly 150 million metric tons by 2030 (estimating 20-25 million metric tons in growth every five years) (Statista, 2023).

This growth of fiber production also leads to the growth of fiber and textile discard. In the United States alone, consumers spend nearly \$400 billion annually on fashions leading to excessive consumption and disposal practices. This results in approximately 7.6% (10.5 million tons) of all landfill waste being textile-based (EPA, 2019). Design scholars and researchers have proposed new and innovative approaches for addressing textile waste such as upcycling or repurposing, which utilizes discarded in the design process to produce a value-added product (Eike et al., 2020; White, 2022). Another approach to reducing textile waste in the design process can be through utilizing a zero-waste cutting process, which results in no textile waste in the design (Rissanen & McQuillan, 2016).

Presently, textile production for fashion is monopolized by cotton and polyester (Krifa & Stevens, 2016). While there are positive and negative impacts to both natural and man-made fibers, such as biodegradability vs. fiber recyclability, textile fiber progress should invest in developing new fibers and options to advance the path towards circularity (Blum, 2021). This development in fashion fiber options has been referred to as material diversity. Material diversity is a concept that emphasizes the importance of using a variety of materials that have a lower environmental impact (i.e., they can be produced with less waste, water, and energy). By using a diverse range of materials, the fashion industry can reduce its dependence on resource-intensive materials and improve its overall sustainability. Diverse sustainable materials that are increasingly being used in the fashion industry include: cork, mycelium or mushroom and, bio-cellulose (Fletcher, 2008). Some examples of apparel scholarship that have focused on diverse material use include Woodruff's (2022) Rubigo, which utilized hemp, while other scholars have created accessories out of bacterial cellulose (Ghalachyan, 2017) and kombucha (Sayers, 2022).

The goal of the design challenge was to contribute to sustainable design scholarship by creating a zero-waste cutting fashion accessory that considers and supports material diversity. Therefore, the purpose of PinaClutch: No Waste! was to create a zero-waste fashion purse made from Pinatex (pineapple leather). The production process to create this pineapple leather involves extracting the leaf fibers and then felting them to form a non-woven textile. Pinatex is a highly sustainable material due to its biodegradability, reduced water usage in production, and the lack of chemicals in the production process (Blum, 2021). Pineapple leather is an example of a sustainable textile that supports material diversity. By using sustainable materials like Pinatex and adopting material diversity principles, the fashion industry can reduce its carbon footprint, conserve resources, and promote a more sustainable future (Fletcher, 2008).

PinaClutch: No Waste! built upon past creative scholarship design works to incorporate both material diversity and innovative pattern-cutting processes. Unlike past sustainable design publications

that centered on producing sustainable clothing outputs; PinaClutch: No Waste! provides unique implications for sustainability in accessory design. The design and fabrication process to create PinaClutch began with researching and selecting sustainable materials for the challenge. After researching and reviewing various materials appropriate for a handbag accessory end product Pinatex, a sustainable leather alternative, was selected. The color of the Pinatex fabric, Sage, was based on the current color trend for luxury bags (WGSN, 2023). Once the material was selected, the handbag's silhouette, inspired by the natural shape and textures of a pineapple, was designed. The handbag's design included a top solid coconut button closure, a wristlet strap, and an interior pocket.

To approach the zero-waste concept, a zero-waste pattern-making technique was employed, which involves using the entire fabric to create an end product (McKinney et al., 2020). Additionally, a tessellation pattern-making approach to zero waste design was utilized for the surface design. Figure 1 illustrates the pattern for the interior pocket and surface design. The pineapple fruit, itself, informed the aesthetic and inspiration for PinaClutch. The texture of the Pinatex material captures the unique texture of a pineapple while horizontal, vertical, and diagonal lines, inspired by the grooves of the pineapple to create a tessellated pattern for the surface of the handbag design. A muslin sample was prepared to ensure that the design would work as intended in practice. Once all patterns were finalized, a laser cutter was used to precisely cut the Pinatex fabric and ensure clean edges. 100% cotton thread was employed to stitch seams together, and intentional strips of the Pinatex fabric were employed to visually finish seams and edges, providing some additional strength to the infrastructure of the clutch, along with the use of circle cut-outs inside. The result was a 6.6" x 11.4" sustainable fashionable accessory that aligns with the principles of circular fashion and provides one potential solution to the problem of waste in the fashion industry.

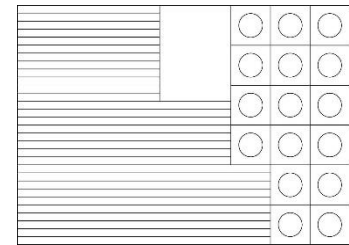


Figure 1. Pattern for the interior pocket and surface design.

To ensure cohesion in the design process, natural shapes of the pineapple fruit served as the main inspiration. I studied the shape of a pineapple and used it to create the shape and surface design of the PinaClutch. I also studied the diamond shape present on the surface of the pineapple and used it as inspiration for the repeating pattern, creating a visual repetition that mirrors the diamond pattern. This repetition not only adds visual interest but also references the distinct shape of the fruit. Additionally, the strips of Pinatex fabric weave in and out of the diamond and circular shapes, creating a sense of movement and rhythm. This interplay of lines and movement within the design evokes the organic flow found in the textures of the pineapple. By using the pineapple as a central theme, the design process was cohesive and resulted in a product that reflects the fruit's unique characteristics through the careful consideration of elements such as repetition and principles like line and movement.

PinaClutch: No Waste! has significant implications for academia and the fashion industry. This creative scholarship piece showcases the potential of combining material diversity and zero-waste pattern-making techniques in a singular fashion product. The clutch handbag can serve as a model for fashion companies looking to adopt sustainable practices in both processes and materials specifically for accessories. Scholars can consider PinaClutch design as one way to look to nature for direct inspiration (color, texture, and shape) in their design process while using the proposed zero-waste pattern cutting diagram for unique product surface detailing. Overall, PinaClutch: No Waste! Yielded a fashionable product that can help inform fashion brands commitment to circularity and environmental responsibility while attracting consumers who prioritize sustainability and contemporary fashion trends.

References

- Blum, P. (2021). *Circular Fashion: making the fashion industry sustainable*. Hachette UK.
- Eike, R. et al. (2020) 'Repurposing design process', in Muthu, S.S. and Gardetti, M.A. (eds) *Sustainability in the Textile and Apparel Industries: Sustainable Textiles, Clothing Design and Repurposing*. Cham, Switzerland: Springer, pp. 189–239. <https://doi.org/10.1007/978-3-030-37929-2>
- EPA. (2019). *Facts and figures about materials, waste, and recycling: Textiles: material-specific data*. United States Environmental Protection Agency. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data>
- Fashion United. (2022). *Global fashion industry statistics*. Global General Data: Statistics. <https://fashionunited.com/global-fashion-industry-statistics>
- Fletcher, K. (2008). *Sustainable Fashion and Textiles*. Routledge.
- Krifa, M. & Stevens, S. (2016) Cotton Utilization in Conventional and Non-Conventional Textiles—A Statistical Review. *Agricultural Sciences*, 7, 747-758. doi: [10.4236/as.2016.710069](https://doi.org/10.4236/as.2016.710069).
- Ghalachyan, A. (2017). Made from scratch: A sustainable handbag made of bacterial cellulose grown in fermenting tea. Juried fashion design in the International Textile and Apparel Association Annual Conference design exhibition, St. Petersburg, FL.
- McKinney, E. et al. (2020). *Analysis of Zero Waste Patternmaking Approaches for Application to Apparel*. In: Muthu, S., Gardetti, M. (eds) *Sustainability in the Textile and Apparel Industries. Sustainable Textiles: Production, Processing, Manufacturing & Chemistry*. Springer, Cham. https://doi.org/10.1007/978-3-030-37929-2_2
- Rissanen, & McQuillan. (2016). *Zero waste fashion design*. Bloomsbury.
- Sayers, M. (2022). Drink and wear kombucha? A sustainable approach to fashion. Juried fashion design in the International Textile and Apparel Association Annual Conference design exhibition, Denver, CO.
- Statista (2023). Production of textile fibers worldwide from 1975 to 2020, with forecast for 2025 and 2030. Statista Research Department. <https://www.statista.com/statistics/1250985/global-textile-fiber-production/>
- Townsend, T., & Sette, J. (2016). Natural fibres and the world economy. In *Natural fibres: advances in science and technology towards industrial applications: from science to market* (pp. 381-390). Springer Netherlands. https://link.springer.com/chapter/10.1007/978-94-017-7515-1_30
- WGSN and Coloro announce the key colours for a/W 23/24. WGSN. (n.d.). <https://www.wgsn.com/en/wgsn/press/press-releases/wgsn-and-coloro-announce-key-colours-aw-2324>
- Woodruff, S. (2022). Rubigo. Juried fashion design in the International Textile and Apparel Association Annual Conference design exhibition, Denver, CO.
- White, L. (2022). The Denim Kintsugi Project. Juried fashion design in the International Textile and Apparel Association Annual Conference design exhibition, Denver, CO.

