Wearing Many Hats: A Green Approach to Accessories Design

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Introduction: The industrial revolution encouraged humans to increasingly satisfy their needs through control and conquest of natural resources rather than coexistence and harmony with other creatures (Burns, 2011). Subsequently, overconsumption of precious resources, unethical land practices, deconstruction of ecosystem services, and unabated release of toxic chemicals and greenhouse gases have degraded the environment and caused the extinction of some species of plants and animals. However, the general cultural spirit, or zeitgeist (Brannon, 2015), has shifted in the 21st century, with a growing awareness of environmental concerns (Cole, 2008) and the start of a sustainability revolution (Burns, 2011) that seeks to protect the environment and preserve natural resources (Yeung & Yeung, 2011).

Literature: The apparel industry is a major polluter. Pollution is created through different phases of apparel lifecycle, including producing fabric from raw fiber, manufacturing apparel from fabric, and disposing of used apparel (Gwilt, 2014). Taking into account the rising demand for apparel products induced by the ever-growing population (Worldometers, 2019), it becomes clear that the industry's negative impacts are intensifying. Fortunately, owing to consumers' awareness and their preference for purchasing eco-friendly-labeled products (White, Hardisty, & Habib, 2019), manufacturers are progressively adopting techniques that enable them to present more environmentally friendly products that address consumers' desires and thus perform better in the competitive business market.

Many apparel items are made of synthetic materials, such as nylon and polyester (Cirino, 2018). These are derived from petrochemicals or other toxic, non-biodegradable chemicals; their production process consumes more energy than with natural fibers and releases greenhouse gasses that are 300 times more potent than CO2 (EPA, 2019). Substituting biodegradable natural fibers derived from plants and animals for synthetic fibers can reduce pollution from apparel production and disposal. The plant fibers available in the market are derived from seed hairs, inner wall of fruits, bast fibers, and leaf fibers. Although many studies have examined the extraction of fiber from different parts of plants, few have researched plant roots as a potential source (Collet, 2017; Matsumoto, 2008; Scherer & Kleis, 2017; Yasuhiro & Akiko, 2009).

Felting is an ancient technique that uses wool fiber, a renewable and environmentally friendly material from animals, to produce fabric. Nuno felting, developed by Polly Stirling in 1990, is a more recent felting technique that uses wool in combination with other fibers like silk (Schofield & Kilfoyle, 2014). The advantage of this technique is its ability to produce lighter garments able to be worn in different weather conditions (C. White, 2007).

The use of natural dyes is another strategy that may lead to greener products. Compared with artificial dyes, natural dyes are less durable and offer less variation in shade. However, they are derived from bioresources which have fewer negative impacts on the environment (Yusuf, Shabbir, & Mohammad, 2017).

Designers must wear many hats if they are to help reduce the pollution of apparel industry (Gwilt, 2014). Production concept, pattern development, construction techniques, market analysis, sourcing, and selecting appropriate materials are among designers' responsibilities if they are to develop green products with minimal negative environmental effects.

Objective: The main objective of this project is to develop a sustainable, functional, wearable, and artistic hat as a proposed green product, and in the process, to draw attention to environmental concerns and endangered species.

Inspiration: Rafflesia arnoldii (Fig.1) is the largest flower currently extant on the planet. Each of its pedals can grow to be 3 feet across and weigh up to 15 pounds (Barkman et al., 2008; Beaman, Decker, & Beaman, 1988). In its natural habitat, Sumatra, women use the plant's buds to stop internal bleeding and shrink the womb after childbirth, and men use it as an aphrodisiac (Thulaja, 2006). Unfortunately, R. arnoldii is at risk of extinction, mainly due to destruction of its habitat by humans (Beaman et al., 1988; Tahir & Manan, 2017).

Fig.1. Rafflesia arnoldii (Worldatlas, 2019)

Method: To achieve the study's objectives, the researcher grew a sustainable fiber source, grass root, and used it to produce a wearable hat. The hat's decoration was inspired by an endangered plant, R. arnoldii, and was implemented using felting techniques and natural materials. The process began by planting wheat seeds and carefully warping the growth pattern in several semispherical surfaces. After 15 days of exposing the sprouts to sunlight and spraying them with water, the naturally woven roots were separated from the stems to yield the "fabric". The mat of roots was placed on the same semispherical surfaces and air-dried. Then, the individual grown root patterns were stitched together by hand. This fabric serves as the main surface of the hat, and the inside was lined with nuno-felted wool to provide comfort and prevent itching. The decoration, symbolizing the endangered Rafflesia flower, was created by hand felting. The Nuno felting technique was used to create a lightweight strap for the hat. Materials included superfine merino wool, wool slubs, 100% silk fabric, and silk cocoon waste. To prevent the waste of natural resources, green-brown dye was extracted from the fresh grass of the cut roots to dye cocoons and silk fabric in the other project. This product is the outcome of integrating multiple considerations and techniques (including sourcing and selection of natural materials and felting) to portray the endangered environment and produce a wearable hat with minimal negative environmental effects. Increased use of natural fibers sourced from plants by the apparel industry could help reduce air pollution, absorb carbon dioxide, and

release more oxygen. In addition, the use of felting techniques can significantly reduce the amount of energy and water consumed in the process of apparel production. Further, the amount of pollution created by the use of chemical dyes can be moderated by using natural dyes.

It is the researcher's hope that environmentally conscious consumers enjoy wearing this product and see it as inspiration to promote sustainable culture.

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