

ECO-DESIGN: FASHION AND TEXTILE INDUSTRY CHALLENGES AND EDUCATIONAL APPLICATIONS

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Abstract: *Sustainability is an idea integrated into all creative industries, including the textile industry. The development of an eco-conscious approach has now become a cornerstone of modern textile and fashion design education. Eco-conscious fashion brands and "green collections" are born daily; analysts estimate that the trend towards environmentally conscious production of textiles and clothing will intensify in the context of increasingly apparent signs of climate change. Simultaneously, the interest of fashion-sensitive members of the self-conscious and environmentally conscious Y and Alpha generations will be increasingly focused on purposeful, eco-thematic training. Since the recent epidemic, it has been well known; there is great educational potential in on-line training on the theme of eco-design. However, it is not easy to develop up-to-date teaching material on a topic that has such a wide range of quality literature! This article presents a course module developed within a project funded by the European Union's Interreg Central Europe Programme, which deals with the textile and fashion design aspects of eco-design. This article intends to present the course content briefly.*

Keywords: *eco-design, Sustainable Fashion, fashion education, course module*

GOIN' GREEN

By "going green," we consider the process of changing thinking, attitudes, and lifestyles, and consumption habits, and its environmentally conscious approach. This responsible decision-making behavior advocates the long-term use, reuse, and recycling of products in all possible ways while reducing the impact of consumption on the environment. These conscious decisions will help protect the earth's renewable resources in the long run, focusing on their conservation rather than continuous exploitation. The green revolution is an environmentally conscious approach to living and thinking by making responsible choices to reduce the environment's imprint. It is considered a gradual process of changing the lifestyle by reusing and recycling products whenever possible and making choices that will help preserve the earth's non-renewable resources instead of destroying them. After three decades of work and struggle, the fashion industry's ethical and environmental movements have created a new segment in the fashion market: eco-design textiles and fashion products sustainable fashion segment. It also made new relations and interests. The purchasing decisions of self-conscious millennials, who grew up in the multicultural network of consumer society, are mostly driven by environmental awareness, in addition to quick conclusions.

The New Age fashion consumer is interested in fashion only in it is environmentally, economically, and socially aware. For Generations Y and Alpha, who are committed to the Planet's future, it is natural that they are vividly attracted to making fashion sustainable. [1] [2]

SUSTAINABILITY IN THE TEXTILE AND FASHION INDUSTRIES

By sustainable fashion, we mean the processes by which fashion products are designed and manufactured responsibly, taking into account the environmental and social impacts of clothing and accessories. As a trend in sustainability in the textile industry, it aims to reduce the ecological footprint of industrial processes in the long term through and support environmental protection and social responsibility initiatives. As a movement and strategy, it promotes change at all levels of the industry. It aims to transform textile production and the fashion industry towards environmental integrity and social justice. The sustainability movement, which dated back to the late 1990s and became a global movement in 2013 due to known events, consciously and conceptually spreads the idea of sustainability through campaigns, professional events, and training. As a result, more and more people now agree that sustainable fashion is the only way for the fashion industry, so consumers pay more attention to shopping.

The project's training material highlights that the textile industry is one of the oldest sectors in consumer goods production, among the leading industries that impact the environment. This diverse and heterogeneous sector covers both natural and artificial raw materials, covering the entire production chain, transforming them into the most varied end-use goods - in cooperation with other actors in the economy. In terms of trade intensity, we are talking about the second-largest economic activity in the world. The cause of the "unsustainable state" of fashion is found in the constant market flow of new goods and globalized manufacturing processes. It has made it possible to produce clothes and clothing accessories at low prices that have created significant environmental threats over the past decade.

The paradigms shift, and moving towards sustainable fashion and raising awareness are renewable challenges for education. Active decision-making on social issues, meeting the criteria of transparency and sustainability, has recently become a next-generation fashion brand expectations. It is arguably essential in these processes that textile and fashion designers have a responsibility to incorporate the idea of sustainability into their production processes.

CIRCULAR ECONOMY IN THE TEXTILE AND FASHION INDUSTRY

In a holistic approach to the production of textile products, it is important to emphasize:

- A.) The importance of production conditions and the environmental footprint of products on the environment throughout their life cycle;
- B.) Effects can occur from fiber and filament production to dyeing or textile printing; the environmental footprint of finishing processes; energy used in production, waste;
- C.) In addition to the economic and ecological aspects of the production of goods, social, cultural, and financial aspects.
- D.) Since significant environmental impacts occur during use, raising awareness of the importance of taking responsibility is needed in all areas. All actors in the supply chain have a role in reducing the environmental footprint of textile products. A sustainable approach can be incorporated into critical stages of the product life cycle, all industry actors' daily routine. This

process begins with fashion and textile design education, as well as fashion product management education.

The circular economy is an economic system that aims to eliminate the continuous use of waste and resources to redefine growth, in contrast to the "take-make-waste" extractive industrial model. It also aims to keep products, equipment, and infrastructures in use for more extended periods, thereby improving their productivity by focusing on positive social benefits. Relying on renewable energies, the circular model builds economic, natural, and social capital over the linear one. Reducing the resources used helps to reduce pollution.

The concept bases on three principles: making waste and pollution predictable, keeping products and raw materials in long-term use, and continuously regenerating natural systems.

From linear to circular systems

The circular economy is a more sustainable system than the linear economy, in which all the "waste" has to become the "food" of another process. It features a system-oriented concept, durability and reusability, continuous renovation and recovery, and that maintains human needs and considerations. The textile industry is one of the sectors that has integrated the principle of the circular economy. (Fig. 1)

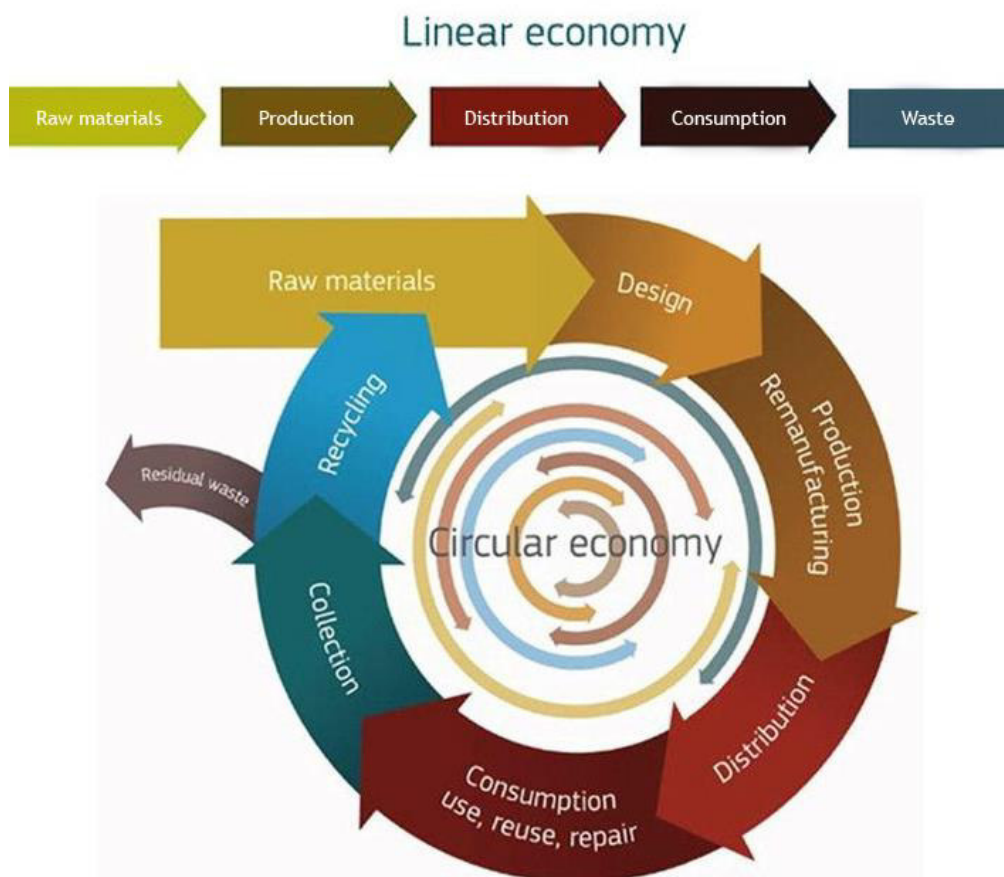


Figure 1: From linear to circular systems

In the textile and fashion industry, the circular economy means the continuous recycling of the fibers used to make garments and textiles, in response to the current linear model where raw materials are extracted, manufactured, purchased, used, and then discarded by consumers. With the circular economy model, the textile industry can be made a sustainable sector, with textile waste returning to the economy as much as possible.

The textile industry has a long way to go to achieve a sustainable future. The circular economy model's application can provide answers and solutions to the social and environmental issues arising from the current linear, "Fast Fashion" business model.

ECO-DESIGN

Ecological design, or popularly: eco-design, the science of eco-design methods that can be integrated into the sustainability trend, an environmentally conscious approach to product design; consideration of the environmental impact of the product throughout its whole life cycle. Ecodesign "applies to any form of design that minimizes the devastating effects on the environment by integrating itself into living processes." Eco-design has an impact on all areas of design and environment design: it affects the way and processes of designing and manufacturing clothing and accessories, but also the creation of household appliances, furniture, and toys. It is also present in architecture, lighting and energy design, and transportation.

Environmentally conscious textile and fashion design

The natural world has always inspired designers. As the fashion industry has underexploited natural resources and wildlife, fashion's relationship with nature has deteriorated over the past few hundred years. There is a need to change attitudes, practices, and innervations, which means rejecting the exploitation of wildlife and natural resources for dressing purposes. New, less destructive, healthy, and sustainable communication with the world is achieved by maintaining "well-dressed" conditions appropriate to environmental and climatic conditions, keeping pace with technological development and civilization's expectations, while consistently reflecting the cultural, social, and - and social affiliation and individuality.

Eco-fashion is an environmentally conscious approach to the design and manufacture of clothing and accessories, taking into account, in addition to the above, environmental considerations, the health of consumers, and the working conditions of workers. Eco-fashion products are made: 1. By using organic raw materials grown without pesticides; 2. By avoiding fabrics treated with harmful chemicals and bleaches; 3. Often from recycled and reused textiles or recycled fibers; 4. Made to last so that people can keep them for longer; 5. Made under the conditions of "fair trade."

AREAS OF ECO-DESIGN ACTION IN THE TEXTILE INDUSTRY

The circular economic model's fundamental goal is to improve the quality of life by maximizing ecosystems' potential in the long run and using the right technologies. The new paradigm requires us to look at routine processes differently. For example, the textile and fashion industries use large amounts of water and energy; the two are highly worrying resources worldwide. The production and consumption of both fashion and textiles are a significant source of pollution. The eco-conscious design offers several solutions to solve these.

Application of the "cradle to cradle" principle

The Cradle to Cradle (C2C) principle is a biomimetic method of designing products and systems. A system that models industrial processes in the light of natural processes has also been applied in the fashion industry. The flow of fashion products in a closed system, i.e., based on the C2C principle, increases the fashion industry's sustainability.

The use of environmentally friendly, easily recyclable raw materials, efficient and energy-saving production processes and production methods must be considered in the design and production to consistent application of the principle. To create value, the designer must pay attention to economic and environmental, and social aspects. Interactive approaches and close collaboration with supply chain actors are ways to achieve greater sustainability and significant benefits. [3]

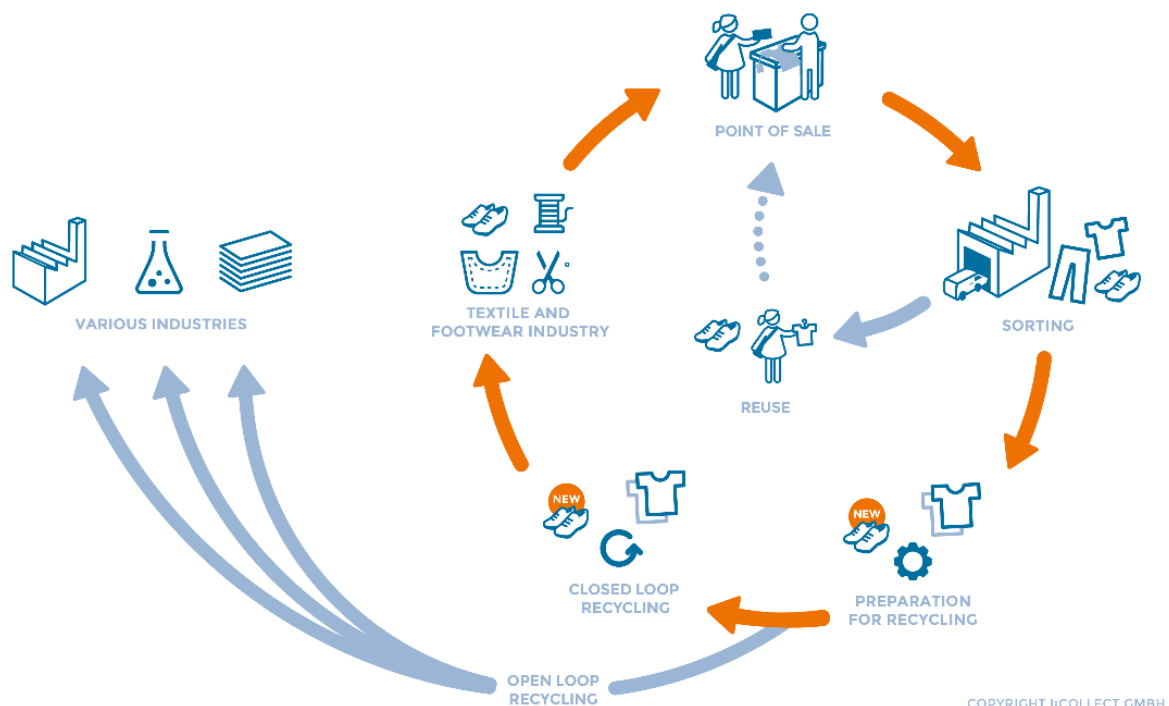


Figure 2: Flowchart of the closed and open system of the clothing supply chain
(Source: ico-spirit.com)

Waste management solutions

There is a lot we can do to protect the environment through a **redesign**. The first recycling concepts were born in the hippie era of the 60s. The use of "treasures" found in second-hand stores to redesign, recycle, and renovate existing, bored, discarded, and useless items still inspire many designers.

Resale and clothing rental services have become an increasing trend in the fashion market to extend clothing life. Many clothing brands have already integrated the resale and used clothing sales business model into their profiles. "Clothing as a service" also seems to be becoming a basic business model in the fashion market.

The **clothing repair** culture, which had been lost for decades as an almost extinct activity, was back in vogue. As part of the slow fashion trend, many companies offer repair services to their customers to help extend the life cycle of the clothes they purchase in their chain. (Fig.3)

Recycling is the operation or process of converting waste into recyclable material. Fibers of various origins in clothing (natural, artificial, including many different types) are challenging for recycling.



Figure 3: Illustrations from the tutorial

ECO-APPROACH TO FASHION-MAKING

Eco-fashion is a complex and multifaceted relationship with the environment. Many believe it was sought first time after in the hippie style of the 1960s. The seeds of eco-fashion in the modern sense were taken by the profession in the early 1990s when environmentally friendly fabrics increased. From the beginning of human civilization, the use of natural (animal, plant) raw materials was evident, as was the fact that humans made as much clothing as they used. With the introduction of synthetic fibers since the middle of the twentieth century, when the textile and clothing industry met mass demand with relatively cheap quality, the situation has changed. It is now clear that creation without knowing the ultimate purpose is a waste of time, energy, and resources! Choosing the right material and technology is the key to the future sustainability of the fashion industry.



Figure 4: Illustrations from the tutorial

Environmentally friendly raw materials and production technologies

Complex and diverse scientific models are available and used to assess the environmental impact and ecological sustainability of different textile fibers. Factors influencing tissue sustainability:

- The ability and source of fiber renewal
- The process of processing the crude fiber
- Effects of fiber preparation and dyeing
- Energy used in the production process

Also: the working conditions of the people producing the materials, the total environmental footprint of the material, the transport conditions, the handling and washing of the product, and; *What happens to the product at the end of its life?*

Conscious, sustainable, and transparent production processes

Widespread environmental awareness has made textile, and fashion companies realize that reputation, transparency, and environmentally friendly manufacturing are the new "state-of-art." Key players in the fashion industry are collaborating to develop industry-wide sustainable technology solutions and processes. The global introduction of extended producer responsibility requires fashion companies to reduce their waste and pay their employees a fair and equitable living wage. Transparency in the clothing supply chain is now the foundation of a fashion company after most fashion companies have acknowledged that a reputation costs more than an investment. Transparency of textile supply chains is a universal goal, in which training, networking, and associations have a crucial role to play.

Introduction to organizations, projects, cooperation, and good practices play an essential role in eco-design education.¹

¹ The training path concludes with a presentation of organizations, inspirational collaborations, student work, valuable initiatives, and a list of well-known international bibliographies relevant to the field.

SUMMARY

The sustainability of fashion, as a trend, seems to be strengthening today in the context of climate change. The interest of members of the self-conscious and environmentally conscious millennial generation, raised in consumer culture and receptive to textiles, clothing, and design, is focused on market-oriented, concept-oriented, consciously structured, exciting, and competitive eco-thematic training. Well-structured eco-design themes cover a wide range of topics that will enable a skilled generation of young professionals to make fashion truly sustainable in a real sense. This paper summarized the content of such a training material developed within the ENTeR project framework (CE 1136), implemented with the support of the European Union under the Interreg Central Europe Program.²

The training path has also been introduced in several Hungarian and international conferences, fashion forums,³ and an article on-demand. It has also been published in Hungarian translation about the training path material. [1] All this justifies the increased interest in eco-design topics in textile and fashion education. This article presented such an e-training, pointing out the issues that need to be taught in eco-design education.

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² You can find information about the project at the following link:

<https://www.innovatext.hu/hu/innovacio/nemzetkozi-projektek>

³ Donghua University (DHU) THE SUSTAINABLE FASHION FORUM - 8-9 December 2020