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CIRCULAR FASHION AWARENESS AMONG FASHION DESIGN STUDENTS IN RESPONSE TO FASHION WASTE

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Abstract. *Fashion waste poses a major challenge to building a more sustainable fashion industry, making it important to understand fashion students' awareness of circular fashion during their education. This study aims to describe students' knowledge, attitudes, practices, behavioral intentions, and barriers in applying circular fashion principles in response to fashion waste. A descriptive quantitative approach with a cross-sectional survey design was employed, involving 86 Fashion Design Education students in their fifth semester or above. Data were collected through a questionnaire and analyzed descriptively using frequencies, percentages, and mean scores. The results showed an overall knowledge score of 74.34%, while attitudes, pre-consumer practices, post-consumer practices, and behavioral intentions were categorized as high. However, several aspects remained limited, particularly knowledge of blended-fiber recycling, textile waste sorting, the use of fabric scraps for sampling, and changes in clothing consumption habits. Barriers were also high, mainly the requirement to use new fabrics in practicum courses, time constraints, costs, limited waste-management facilities, and inadequate storage space. The study concludes that students have developed relatively good awareness of circular fashion, but its implementation requires stronger technical competencies and greater institutional support.*

Keywords*: circular fashion, Fashion waste, Sustainable fashion, Fashion education, student awareness.*

PRELIMINARY

The fashion industry contributes significantly to global economic growth, but it also generates substantial waste that has become a global problem. The industry produces 100–150 billion garments annually, consuming 93 billion m^3 of water, emitting 1.2 billion tonnes of CO_2, and releasing about 500,000 tonnes of microplastic fibers into the oceans (Gazzola et al., 2020). More than two-thirds of textiles end up in landfills, and only about 15% are recycled (Shirvanimoghaddam et al., 2020). Of the approximately 92 million tonnes of textile waste generated each year, more than 80% is landfilled or incinerated (Gupta et al., 2022; Shamsuzzaman et al., 2023).

Increasingly rapid trend cycles, mass production, and short garment use have steadily increased the volume of discarded clothing. Average annual textile consumption has doubled over two decades from 7 kg to 13 kg per person (Shirvanimoghaddam et al., 2020). Waste arises not only from post-consumer clothing but also from production residues such as fabric scraps, defective products, samples, and unsold stock. The textile sector produces about 2–8% of global greenhouse gas emissions, uses around 215 trillion

liters of water annually, and contributes about 9% of ocean microplastic pollution (United Nations Environment Programme, 2025). In Indonesia, fashion waste is estimated at 1.7 to 23 million tonnes and continues to grow every year (Ismah et al., 2024).

This problem stems from the linear take-make-dispose economy, which relies on cheap materials and energy, encourages intensive resource use, and neglects reuse and recycling (Sariatli, 2017). Fast fashion further accelerates consumption and shortens product lifespans. In response, circular fashion applies circular economy principles to keep products, materials, and resources in use for as long as possible through reuse, closed-loop approaches, waste reduction, and resource efficiency (Sariatli, 2017).

Circular fashion emerged as an alternative to the linear take-make-use-dispose system. It seeks to maximize the product life cycle from raw material sourcing to final disposal while promoting zero-waste design, reuse, repairability, servitization, and resource sharing (Mishra et al., 2021), replacing the "end-of-life" concept with recovery so that resources remain in use longer (Colucci & Vecchi, 2021). The earlier 3R concept (reduce, reuse, recycle), which focuses mainly on the end-of-life stage, has evolved into 6R and 9R frameworks that include strategies such as refuse and rethink to drive systemic change in product design and use (Khaw-Ngern et al., 2021; Tan et al., 2024). This has further been extended into a 10R framework: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover (Muñoz et al., 2024), as shown in Figure 1.

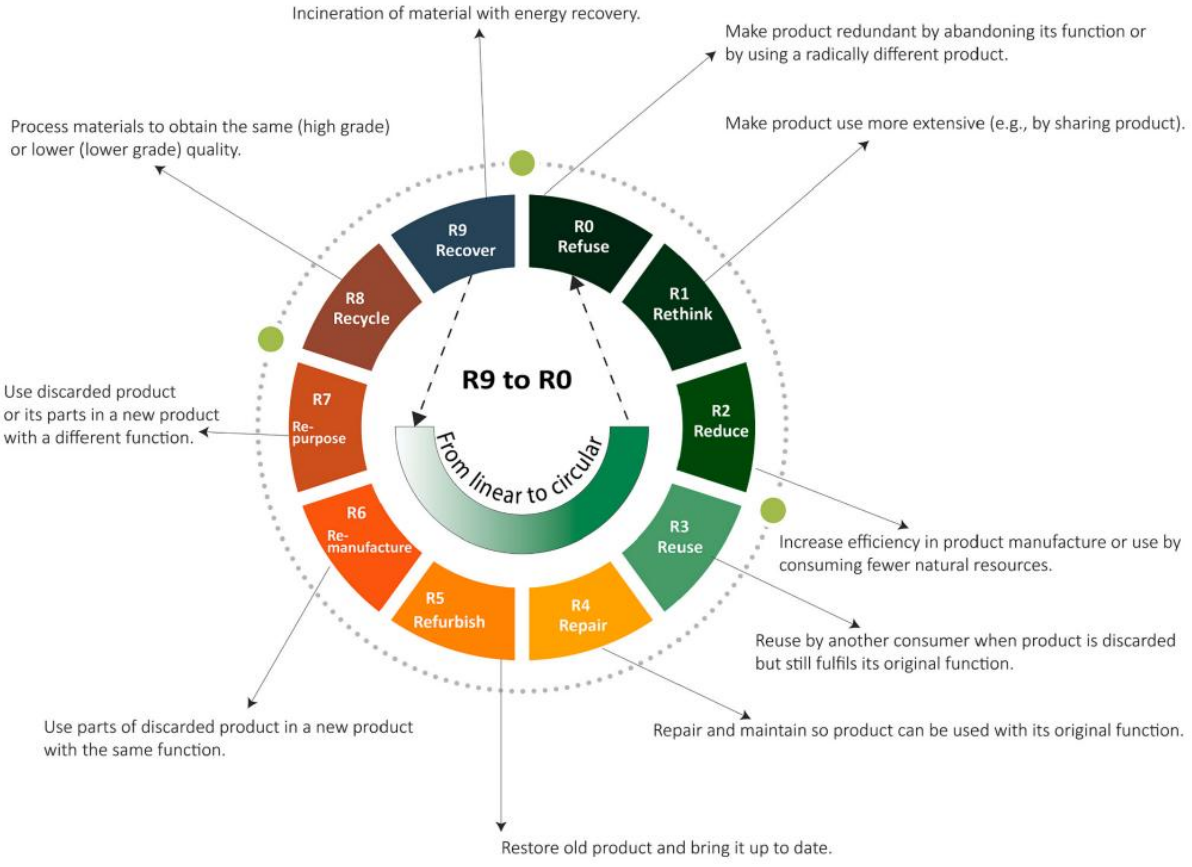


Figure 1. The 10R Framework
Source: Muñoz et al. (2024)

Circular fashion awareness reflects an individual's understanding of and concern for the environmental impacts of producing, consuming, and disposing of fashion products, together with the tendency to apply circular practices. Fashion education plays a role in building sustainability practices

through the curriculum, student activities, learning strategies, and material management (Bedor et al., 2024). Students' circular economy awareness can be examined through three dimensions: knowledge, attitude, and behavior (Rahmatika Dewi et al., 2022).

The success of circular fashion depends not only on technology and policy but also on individual awareness, as highly aware individuals give greater consideration to environmental impacts when selecting, using, caring for, and disposing of fashion products (Suk & Lee, 2017). Fashion design students hold a strategic position as future designers, educators, practitioners, and entrepreneurs; the knowledge and awareness they develop during their education will shape how they design, select materials, produce, and consume. In Indonesia, however, circular fashion is still rarely discussed, and research on fashion students' awareness of fashion waste remains limited, as previous studies have focused mainly on consumer behavior and industry practices. This study therefore aims to analyze fashion design students' awareness of circular fashion in response to fashion waste, providing a basis for strengthening sustainability-oriented fashion education.

RESEARCH METHODS

This study employed a descriptive quantitative approach with a cross-sectional survey design, measuring students' knowledge, attitudes, practices, behavioral intentions, and barriers regarding circular fashion without any intervention. Respondents were 86 students of the Fashion Design Education Study Program, Universitas Pendidikan Indonesia, selected through purposive sampling: students in their fifth semester or above, who had completed foundational fashion courses and entered their specialization groups. The questionnaire, distributed via Google Forms, comprised seven sections: respondent data, knowledge, attitudes, pre-consumer (practicum waste) practices, post-consumer (personal clothing) practices, behavioral intentions, and barriers. Knowledge was measured with True/False/Don't Know items (1 for correct; 0 otherwise) and converted into percentages; the other variables used a five-point Likert scale, with negative statements reverse-scored. Data were analyzed using frequencies, percentages, and means. Mean scores were interpreted as 1.00–1.80 (very low), 1.81–2.60 (low), 2.61–3.40 (moderate), 3.41–4.20 (high), and 4.21–5.00 (very high) (Pimentel, 2019).

RESULTS AND DISCUSSION

Respondent Characteristics and Exposure to Sustainability

Respondents came from the 2024 (44.2%), 2023 (30.2%), and 2022 (25.6%) cohorts. Most had learned about sustainability through integration in other courses (58.1%), only 8.1% through a dedicated course, and 25.6% had never received related instruction. Social media was the main information source (89.5%), followed by lectures (61.6%). This reflects the absence of a dedicated sustainable fashion course in the curriculum, although explicit, practice-based sustainability instruction has been shown to improve students' knowledge of material impacts (Karpova et al., 2024). Most students spent IDR 100,000–300,000 per month on clothing (58.1%), and 74.4% reported producing moderate to large amounts of fabric scraps in practicum work, showing that circular fashion concerns them both as consumers and as future practitioners.

Knowledge of Circular Fashion and Fashion Waste

The overall knowledge score was 74.34%. The highest scores concerned fast fashion characteristics (97.7%), zero-waste pattern cutting (96.5%), and the objectives of circular fashion (94.2%), while the lowest concerned blended-fiber recycling (38.4%) and the impact of donating used clothing (57.0%). Students thus better understand concepts close to design activities than systemic issues of materials and waste flows. Blended textiles such as cotton–polyester are far harder to recycle than single-fiber materials because their fibers must be separated first (Loo et al., 2023). Likewise, donated clothing is beneficial only if it is of good quality and actually reused; otherwise, it still becomes waste. Circular

economy should therefore be taught not merely as technical recycling but as a matter of production, consumption, and system change (Manieson et al., 2021).

Attitudes toward Circular Fashion

Overall attitudes were high (M = 4.09), with the highest scores for concern about textile waste (M = 4.64) and responsibility for reducing it (M = 4.56). Lower, though still high, scores were found for perceptions of upcycled products (M = 3.63), acceptance of thrift clothing (M = 3.66), and willingness to pay more for sustainable fashion (M = 3.74). This reflects the attitude–behavior gap, as price, product characteristics, and availability can hinder positive attitudes from becoming sustainable consumption (Brandão & Costa, 2021), while second-hand clothing is still not seen as a direct substitute for new garments (Boyer et al., 2025; Campos Dieguez et al., 2024).

Pre-Consumer and Post-Consumer Practices

Pre-consumer practices were high (M = 3.81), led by storing fabric scraps for reuse (M = 4.42), arranging patterns to minimize waste (M = 4.40), and calculating fabric needs before buying (M = 4.37). However, sorting scraps by type or size (M = 2.81) and using leftover fabric for samples (M = 2.81) were only moderate. Waste prevention is thus stronger than managing waste once generated. Poor sorting limits recovery because fiber characteristics and composition determine textile recovery pathways (Loo et al., 2023). Project-based learning using textile waste can develop upcycling skills and connect waste issues to students' creative processes (Bui et al., 2024; Osman et al., 2026).

Post-consumer practices were also high (M = 3.73), led by repairing (M = 4.35) and caring for clothing (M = 4.31), whereas buying thrift or preloved clothing was the only moderate indicator (M = 3.23). Extending garment use is a key circular pathway, as more wears per garment reduce environmental impacts by deferring replacement production (Wiedemann et al., 2023). Students' circular behavior is therefore stronger in maintaining owned clothing than in adopting second-hand consumption.

Behavioral Intentions and Barriers to Implementing Circular Fashion

Behavioral intentions were high (M = 3.96), led by applying circular principles in fashion works (M = 4.26) and turning scraps into useful products (M = 4.19), while changing shopping habits scored lowest (M = 3.34; moderate). Intentions are thus stronger in learning and creative contexts than in personal consumption, consistent with the intention–behavior gap in sustainable fashion (Ng, 2026; Pradeep & Pradeep, 2023).

Barriers were also high (M = 3.41), led by the requirement to use new fabric in practicum courses (M = 3.92), time constraints (M = 3.77), the price of sustainable products (M = 3.75), limited storage space (M = 3.64), and limited sorting facilities (M = 3.62). The perception that individual actions have little impact was the lowest barrier (M = 2.53). These findings suggest that the barriers are largely structural rather than motivational (Brandão & Costa, 2021). The new-fabric requirement implies that students may hold circular knowledge and attitudes yet still follow linear academic practices, pointing to opportunities for intervention in curriculum and studio management.

Synthesis of Findings and Implications for Fashion Design Education

Overall, circular fashion awareness has developed among students but is not yet even across all aspects. Students are more ready to retain the value of what they already have (repair, care, scrap storage) than to change consumption systems, and their high intentions coexist with high structural barriers. Providing information alone is therefore insufficient; circular principles should be integrated into learning experiences through scrap-based projects, repair and upcycling, material composition and sorting, and permission to use reclaimed materials in design assignments. As this study is descriptive, these patterns do not indicate causal relationships.

CONCLUSION

This study concludes that fashion design students have developed a good level of circular fashion awareness in response to fashion waste. This is reflected in an overall knowledge score of 74.34% and high levels of attitudes (M = 4.09), pre-consumer practices (M = 3.81), post-consumer practices (M = 3.73), and behavioral intentions (M = 3.96). However, this awareness is not yet evenly distributed. Students understand concepts close to design activities, such as fast fashion, zero-waste pattern cutting, and the goals of circular fashion, better than systemic issues such as blended-fiber recycling and the end destination of donated clothing.

In practice, students' circular behavior is stronger in preventing waste and retaining the value of what they already own, such as efficient pattern layout, scrap storage, repair, and garment care, than in managing waste once generated or changing consumption patterns, as shown by the moderate scores for scrap sorting, the use of leftover fabric for samples, buying second-hand clothing, and changing shopping habits. Moreover, high behavioral intentions coexist with high barriers (M = 3.41) that are mainly structural rather than motivational, particularly the requirement to use new fabric in practicum courses, time constraints, costs, and limited facilities and storage space. Therefore, strengthening circular fashion in fashion design education requires not only awareness-raising but also deeper technical literacy and an academic environment that enables students to translate their knowledge, attitudes, and intentions into consistent practice.

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