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(REVIEW ARTICLE)

Integrating sustainable practices in apparel and textile education in less developed countries in Africa: A curriculum development approach

Sibusiso Sibanda [1], Michael Runesu Shamu [2], Nothabo Bhebhe [3] and Milliam Sundawo [4]

[1] *Department of Creative Arts, Rwanda Polytechnic, P.O. Box 6579 Kigali, Rwanda.*
[2] *Department of Mechanical Engineering, Rwanda Polytechnic, P.O. Box 6579 Kigali, Rwanda.*
[3] *Department of Arts and Crafts, ETO Nyamata Technical Secondary School, Bugesera District, Eastern Province, Rwanda.*
[4] *Department of Arts and Crafts, Nyabihu Technical Secondary School, Nyabihu District, Western Province, Rwanda.*

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Abstract

Integrating sustainable practices into textile education in underdeveloped countries of Africa is essential to addressing the environmental, social and economic challenges facing the industry. This literature review looks at the current state of textile and apparel curricula, identifies barriers to incorporating sustainability, explores effective strategies for curriculum development, and assesses the overall impact of sustainability-focused education on the industry and society. A critical analysis of existing curricula reveals significant gaps in sustainability content, outdated teaching methods, and a parallel relationship between academic training and industry demands. Key obstacles include limited resources, insufficient policy support, and limited collaboration between educational institutions and industry stakeholders. To overcome these shortcomings, effective curriculum development must emphasize interdisciplinary learning, experiential teaching approaches and strong industry partnerships that provide students with hands-on experience with sustainable practices. A well-structured, sustainability-driven curriculum has the potential to foster innovation, improve employability, and develop environmentally responsible fashion professionals. While challenges remain, a collaborative approach involving policymakers, educators, industry leaders and local communities is vital to integrating sustainability into textile education. This review underscores the urgent need for educational reforms that equip future professionals with the skills and knowledge necessary to drive Africa's transition to a more sustainable textile industry.

Keywords: Sustainable fashion education; Curriculum reform; Textile sustainability; Industry partnerships; Circular economy; Africa

1. Introduction

Sustainability in textile and apparel education is becoming increasingly important as the fashion industry faces growing criticism for its environmental and social impact. The industry contributes to pollution, excessive water consumption, and unethical labor practices, making it critical to educate future professionals in sustainable production and responsible consumption (Niinimäki et al., 2020). In many African countries, where the textile sector plays a significant role in economic growth, integrating sustainability principles into education can promote ethical practices and long-term industry resilience (UNEP, 2021). However, progress in integrating sustainability into curricula remains slow due to outdated course content, limited access to sustainable materials and limited collaboration with the industry (Fletcher and Tham, 2015).

*Corresponding author: Sibusiso Sibanda

Historically, textile education in Africa has focused primarily on design, material selection and production techniques while ignoring environmental and social responsibility. While some institutions are beginning to introduce sustainability concepts such as circular fashion and ethical saving, the overall expansion remains curtailed by financial constraints, and a shortage of trained educators continues to limit their widespread adoption (Payne, 2019). Traditional African textile practices such as hand-weaving and natural dyeing, align with sustainability principles and provide a solid foundation for integrating local knowledge into modern fashion education.

A well-structured curriculum requires a holistic approach that integrates sustainability into all aspects of textile education rather than treating it as a standalone subject. Effective strategies include interdisciplinary teaching that connects textile studies with environmental science and business, as well as hands-on learning through partnerships with sustainable brands and artisans. Digital tools, such as 3D design software and virtual prototyping can also enhance sustainability education by reducing material waste (Fletcher & Tham, 2015).

Aligning African textile education with global sustainability standards such as the United Nations Sustainable Development Goals (SDGs) requires greater support and investment in educational reforms (UNEP, 2021). A comprehensive, sustainability-focused curriculum can prepare graduates to drive positive change in the fashion industry, thereby ensuring that Africa contributes to a more ethical and environmentally responsible global textile sector.

1.1. Review Objectives

The primary objective of this article is to review the inclusion of sustainable practices in textile and clothing education at a tertiary level. The paper analyzed the different methods and strategies of incorporating sustainability by looking at curricular integration, interdisciplinary collaboration, industry partnership and community engagement. Further, evaluation of the different successful curriculum models where different case studies, modular course structures, competency based learning and continuous curriculum assessment will be analyzed. The inclusion of different teaching methodologies such as experiential learning, problem based, digital tools and simulation as well as reflective practices will be looked at to find out how sustainability can be incorporated into the education system. Lastly the paper reviews the impact of these practices on student's outcome versus the Industry standards through student competency development, employment opportunities, industry perceptions and long term behavioral changes.

2. Methodology

This review article is drawn from reputable international journals.

2.1. Incorporating sustainability: Strategies

Sustainability in textile and clothing education has gained global attention as the fashion industry faces increasing scrutiny for its environmental and social impact (Fletcher, 2008). The sector contributes significantly to pollution, excessive water use and labor exploitation, underscoring the need for educational reform to train professionals who can implement sustainable solutions (Niinimäki et al., 2020). In developing countries, where the textile and garment industry are integral to economic development, incorporating sustainability into education is essential to foster responsible production and ethical practices (UNEP, 2021).

Among the different methods of lesson delivery, curriculum integration is crucial for fostering sustainable practices in textile and apparel education. In this case, sustainability can be woven into various courses to ensure students develop a comprehensive understanding of its role in design, production and consumption (Fletcher and Tham, 2015). In the same vein, Payne, (2019) asserts the inclusion of sustainability modules into courses such as fashion design, textile science and supply chain management.

Additionally, incorporating problem-based learning (PBL) methodologies encourages students to tackle real-world sustainability challenges, fostering critical thinking and solution-oriented approaches (Gwilt, 2020). Institutions such as the London College of Fashion and Parsons School of Design have successfully embedded sustainability in their curricula, serving as global models for institutions in less developed countries (Fulton and Lee, 2013). However, education institutions often face challenges such as limited resources and a shortage of trained educators capable of effectively delivering sustainability-oriented content (Moore and Birtwistle, 2021).

To address these challenges, education policymakers must develop standardized sustainability curricula that align with international sustainability frameworks such as the UNSDG (United Nations, 2019). Collaborative initiatives between universities, industries and government agencies can help ensure the successful implementation of sustainability-focused curricula (Goworek et al., 2012). Another strategy which is crucial to address sustainability challenges is interdisciplinary collaboration, whereby Fashion and textiles intersect with multiple disciplines, including environmental science, materials engineering, business and social sciences (Muthu, 2017). By fostering interdisciplinary collaboration, institutions can provide students with a holistic perspective on sustainability. For example, integrating textile programs with environmental science courses can help students understand the impact of textile production on ecosystems and develop eco-friendly solutions (Fletcher, 2008). Collaborations with engineering departments can facilitate research on sustainable materials such as biodegradable fabrics and recycled fibers (Niinimäki et al., 2020). Additionally, business and marketing courses can introduce concepts such as sustainable branding, ethical consumption and corporate social responsibility (Payne, 2019).

Case studies of interdisciplinary collaborations have been observed at institutions such as Aalto University in Finland, where the faculties of design, engineering and business have successfully collaborated on sustainability projects (Moore and Birtwistle, 2021). Thus, education institutions from developing countries can adopt similar models by fostering collaborations between different academic departments and promoting joint research initiatives (Goworek et al., 2012).

In connecting academia with practical application of sustainability in the textile sector, Industry partnerships cannot be sidelined. Allwood et al., (2006) suggests that students can gain hands-on experience if they get into partnerships with sustainable fashion brands, textile manufacturers and recycling companies. Industry partnerships can take various forms such as internships, mentorship programs, guest lectures and collaborative research projects. According to Fulton and Lee, (2013), students who undertake internships with sustainable fashion brands are exposed to real-life sustainability challenges and encouraged to adopt green production practices and supply chain management. Furthermore, industry-funded research initiatives can facilitate the development of innovative, sustainable materials and production techniques (Muthu, 2017).

Despite the benefits of industry partnerships, many educational institutions in Africa struggle to establish meaningful collaborations due to limited networking opportunities and financial constraints (UNEP, 2021). However, government support and policy initiatives can incentivize textile industries to collaborate with educational institutions and promote sustainability practices (United Nations, 2019). The relationship between students and the community is very important as far as integrating sustainability practices is concerned. Bhamra and Lofthouse, (2007) highlight that community engagement fosters social and environmental responsibility. If the students partner with local artisans, cooperatives, and small-scale textile producers, it enables students to learn about indigenous sustainable practices, and they can then apply them in modern textile production (Moore and Birtwistle, 2021). For example, initiatives such as participatory design workshops, sustainable fashion events, and community-based textile recycling programs provide students with practical experience in sustainability (Fletcher, 2008). Furthermore, universities can collaborate with local communities to implement circular economy principles, such as upcycling discarded fabrics and promoting zero-waste fashion (Goworek et al., 2012).

Community engagement such as unfair labor practices and empowerment of marginalized textile workers also contribute to addressing the ethical and social aspects of sustainability, (Payne, 2019). However, challenges such as cultural resistance to change and logistical constraints must be addressed to ensure the successful implementation of community-based sustainability initiatives (Muthu, 2017). To overcome these challenges, policymakers must establish standardized sustainability curricula by encouraging collaboration between universities, industries and government agencies to effectively integrate sustainability-focused education in line with global frameworks such as the UNSDG (United Nations, 2019) cited in Goworek et al., (2012).

2.2. Models and Case Studies

In as much as textiles and fashion are an integral part of everyday life and the global economy, it has a negative impact on the environment. Hence, the textile and apparel industry is facing increasing pressure to adopt sustainable practices throughout its value chain from raw material, production, consumption and disposal (Dharwadkar, 2023). These challenges are a result of conventional practices being used in underdeveloped countries which leads to waste generation, carbon emissions, pollution and unethical labor practices (Charter et al., 2023).

According to UNESCO (2020), in developing countries where the textile industry is still growing, there is a need to integrate sustainability into the curricula as this will ensure that graduates will implement responsible practices, contribute to sustainable a global transition, reduce economic disparities and create an equitable marketplace. In order to achieve this, there is a need for higher education institutions to incorporate sustainability assessment tools. When that is done it will effectively eradicate poverty, protect the planet and promote the well-being of humanity, which are the UNSDG's goals (United Nations, 2019).

As such, underdeveloped countries require working models to overcome the above-mentioned challenges. Hence, the introduction of modular courses, competency-based learning and continuous curriculum assessment can equip students with the skills needed to lead in sustainable fashion (Boström and Klintman, 2018). Natasha and Nina, (2023) reiterate that when these strategies are implemented through education, they will be the drivers to transition towards sustainability in the global textile and apparel industry. In this regard, it can be concluded that fashion design for sustainability seeks to balance prosperity with minimal resource consumption, so industry ought to prioritize sustainability through consumer awareness and use of eco-friendly products in order to remain competitive (Dharwadkar, 2023).

A sustainability-aligned curriculum is increasingly recognized as essential for addressing climate change and fostering a low-carbon, circular economy. The academic world is advocating for integrating sustainability into fashion education and is striving to come up with ways to remove systemic barriers (Scott et al., 2025). Institutions leading this effort include the London College of Fashion and Parsons School of Design (Barry and Christel, 2023). London College of Fashion establishment the Education for Sustainability Transformation (EST) model in 2016 to 2022, embedding sustainability across all courses and levels with an emphasis on systems thinking and environmental awareness as well as social, cultural, and economic impacts of fashion on the economy (Junestrand et al., 2024). Apart from EST courses, the college also had an industry partnership model which, according to D'Itria et al., (2024), was the Sustainable Fashion Education Model (SFEM) which looked into ethical sourcing, waste reduction, and environmental consciousness. The implementation of this interdisciplinary collaboration led to continuous based assessment. Furthermore, Ma, (2022) points out that critical thinking is a result of challenge-based learning provoking since students are exposed to solving real-world problems.

In line with the above, Parsons School of Design's established curriculum models which are in tandem with LSF, as they provide a holistic, flexible, and inclusive education that enables students to navigate and contribute to the ever-changing world, thereby solving sustainability challenges in the textile and fashion sectors (Whitty, 2021).

Another player in addressing sustainability challenges in education was the Federation of Fashion Technology Institute (FTSI), which incorporated the UNSDGs since they play a role in shaping the education curricula (United Nations, n.d.). In the same vein, Catacutan et al. (2023) highlight how SDG 12, which focuses on responsible production and consumption, underscores the need for collaboration throughout the supply chain. This calls for the inclusion of Sustainability Competency Based Education (SCBE) since it aligns well with UNSDG's educational goals, which advocate for experiential learning, industry collaborations and interdisciplinary approaches (Murzyn-Kupisz & Dominika, 2021). However, this model can only be effective through the inclusion of technology-driven curriculum which involves digital fashion, bio-fabrication and circular economy models (Henninger et al., 2017). These technology-driven models enhance educational quality by promoting textile advancement, keeping students up to date with industry innovation and helping students solve sustainability issues.

RMIT University's School of Fashion and Textiles exemplifies UNSDG's integration through its FTSI program launched in 2020, which takes an interdisciplinary and multi-sectoral approach (Zabidi and Khairul, 2024). The community engagement initiatives and social responsibility models are particularly noteworthy, as they work with various stakeholders such as artisans who assist students in local and global sustainability efforts in addressing waste management by practicing indigenous and traditional sustainability methods (Açıkgöz & Babodogan, 2021). A good example when students work on a project within the community as they solve a real problem using locally available resources. This can either be through circular economy, upcycling, and recycling. By doing so, students are expected to be creative and innovative in applying sustainability focused methods.

Various institutions implement sustainability in fashion education through diverse curriculum models. Some integrate sustainability principles into broader courses while others offer specific sustainability modules. A study by Abner et al. (2019) redesigned a textiles and clothing course using 'Education for Sustainable Development' (ESD) principles, leading to significant improvements in student awareness and engagement.

Fletcher and Tham, (2015) points out that the University of Arts London, through its MA in Fashion and the Environment, combines theoretical and practical learning. Students collaborate with sustainable brands, gaining hands-on experience in design, materials and sustainable business models. Similarly, Parsons School for Design incorporates modular structures that emphasize interdisciplinary learning in areas such as sustainability and systems thinking (Faerm, 2012).

The Fashion Institute of Technology (FIT) in New York offers programs that combine theory and industry experience. Collaborations with sustainable brands expose students to ethical sourcing and supply chain management with an emphasis on innovative materials and sustainable business strategies (Lorz, 2017). At the same Institute, Moretz (2025) integrated sustainability into garment manufacturing by incorporating zero-waste patterns and design-for-disassembly concepts, demonstrating the effectiveness of integrating sustainability into technical courses.

Competency-based learning is gaining momentum as an approach to sustainability education, requiring structural changes in policies and teaching methods (Açıkgöz and Babodogan, 2021). This model emphasizes active learning, drawing on constructivist and social constructivist theories (Ndihokubwayo et al., 2020). Recent studies indicate a preference for experiential and project-based learning in sustainable fashion courses as these approaches enhance student engagement and contextual application (Zabidi and Jamaludin, 2024). However, adapting competency-based education (CBE) requires understanding the cultural and contextual factors that shape educational practices (Catacutan et al., 2023).

Additionally, agile curricula must balance traditional design principles with the changing demands of the industry, fostering ethical and sustainable thinking. Integrating ethics, entrepreneurship and restorative design will better prepare students for transformative roles in the industry (Baeza et al., 2023).

2.3. Teaching methodologies for sustainable fashion education

The integration of sustainability into educational curricula has become a priority across various disciplines. However, in underdeveloped countries, integrating sustainability into education is often hindered by outdated curricula, limited resources and lack of awareness (Baeza et al., 2023). To bridge this gap, innovative teaching methodologies can be employed to enhance students' understanding of sustainable practices. Maggi and Heather, (2022) suggest that experiential learning, problem-based learning, digital tools and reflective practices are some of the effective methodologies which can enhance students' practical understanding of sustainable practices as outlined below.

Kolb, (2017) talks of a situation where students foster knowledge through direct experience and regarded this as a powerful approach to sustainable education in textile and apparel programs and in 2013, the Association for Experiential Learning Education (2013) defined this approach as an active methodology which enhances skills, clarifies values and empowers learners to contribute to their communities. With this approach, students with past experiences such as hands-on activities and or environmental interactions are given the first priority to contribute. Their input will then be integrated into course design, which enhances critical thinking and deepens learning outcomes from their peers (William et al., 2015).

Afam et al., (2024) reiterates the same notion by suggesting that a hands-on approach is a dynamic and effective strategy for enhancing student engagement and motivation in education. When students are exposed to real-world challenges/projects, it enables them to apply theoretical knowledge learnt. By doing so, the gap between academia and industry will be closed. The writer further points out that direct experiential learning internalizes sustainability concepts. Thus, when students are exposed to sustainable development principles and practical skill-building, they end up developing and embracing a culture, environmental consciousness and social responsibility, enabling them to contribute meaningfully to the fashion and textile industries.

Mertayesa et al., (2024) suggest that if experiential learning is done by way of workshops, it will significantly enhance students' critical thinking skills as it promotes active engagement and deeper cognitive processing. Similarly, Garcia-Guerrero and Lewenstain, (2022) advocate for integrating constructivist and constructionist approaches into workshops, which enable students to build knowledge through participation and the creation of tangible artifacts. Workshops provide opportunities for interactive discussions, peer collaboration and expert-led sessions, allowing students to explore innovative ideas, share best practices and gain insights into emerging trends and technologies in sustainable development.

Internships is another form of experiential learning method whereby students are exposed to real-world sustainability challenges in professional set-ups (Clark & Martin, 2016). In this scenario, students work alongside skilled and experienced professionals applying their academic knowledge thereby developing industry-specific skills and building professional networks. During the process, Yanxue, (2022) asserts that students enhance their ability to collaborate with experts, familiarize with industry as well as gaining teamwork and employment experience.

Problem-based learning (PBL) is an instructional approach where students acquire knowledge by addressing real-world problems or issues. Through the process of solving these challenges, students assess how their existing knowledge applies and identify gaps in their understanding, determining what additional information is needed to complete the task (Karthikeyan, 2021). The primary objective of PBL is to empower students to leverage their prior knowledge while honing their problem-solving abilities. In many PBL courses, students form teams based on shared interests, prior relationships, or collaborative experiences. Although team building is formally addressed through class discussions and organized social events, students often engage in informal and unstructured activities to strengthen team dynamics (Katja and Armin, 2013). Other scholars suggest that in most cases there is a paucity of activities that support structured team building activities to prepare for small-group work and professional skills development. As such, students do not assess their skills concerning problem features, anticipated outcomes or sustainability competencies, hence, it is the responsibility of facilitators to encourage students to reflect on how they can solve local issues or use local case studies of innovators to inspire critical thinking.

Digital simulations are defined as computational models of real or hypothesized situations or phenomena that enable users to discover the effects resulting from manipulating or changing parameters within the models (Clark et al., 2009). The spread of digital fashion is not just limited to computer-aided design (CAD) and manufacturing (CAM), but rather runs throughout the fashion business, from product life-cycle management and developing new business models that promote sustainability to connecting virtual and augmented reality with fashion to enhance consumers' experience through smart solutions (Sayem 2022). According to Kyung-Hea, (2022), from the mid-1990s, computer-aided design and digital media, which can be used with fashion garments, have brought about further refinements of high fashion, entertainment-related animated garments and commercial products. With this technological advancement, learning institutions in developing countries are encouraged to introduce and use fashion design software to reduce waste in prototyping and at the same time save production time.

Reflective practice is a process whereby learners transform experiences through watching carefully those involved in the experience and then thoughtfully analyze those actions to learn from them (Mhizha & Mandebvu, 2012). In this case, students critically analyze issues based on their experiences of creative activities to improve their skills while enhancing their solving abilities. During the process, students must be encouraged to continually refine their understanding and application of sustainable principles in order to consolidate their knowledge and skills effectively. When reflective practice is integrated into the learning process, it will help students to deepen their comprehension of sustainable methodologies and enhance their ability to innovate within the field of study (Chen and Ap, 2024). Therefore, students in apparel and textile are advised to keep personal learning journals to document all their work for reference.

2.4. The impact of sustainable practices on students' outcomes and industry trends

As environmental, social and economic challenges escalate globally, fashion education must embrace sustainability (Pervez, 2022). UNESCO, (2020) reported that education is society's most effective tool for addressing these issues. The organization remains a key advocate for Education for Sustainable Development (ESD), highlighting its role in empowering individuals to make informed choices for a sustainable future. In addition, it should go beyond simply providing information; rather it should cultivate critical thinking, clarify values and encourage active participation in developing sustainable solutions (Cotton & Alvey, 2020). Apart from increasing awareness, enhancing design capabilities, promoting ethical accountability, stimulating innovation, encouraging responsible consumption and shaping industry standards, sustainable education highlights the importance of resource conservation. Furthermore, Cotton and Alvey, (2020) stressed the significance of education in cultivating ethical responsibility and sustainability awareness. Similarly, McNeill and Moore (2015) explored how educating consumers impacts their purchasing behavior and attitudes toward sustainable fashion consumption.

Despite numerous authors advocating for sustainable textile education, Henninger et al., (2017) talked about how the challenges of the economy and fast fashion trends make it difficult to translate sustainable fashion education into real-world practices. Fletcher, (2008) pointed out that many fashion programs still lack a comprehensive sustainability curriculum, leaving graduates unprepared for industry challenges and adapting to rapid industry change. Accordingly, Wals, (2021) argue that media and consumer culture often contradict sustainability principles, making it difficult for

education alone to drive behavioral change. At the same time, DeLong et al., (2017) note that sustainable design education requires specialized resources which can limit access to necessary training in some institutions.

Fashion education impacts communities by promoting sustainability through vocational and short courses, equipping students who in turn influence their communities. In conclusion, the effectiveness of sustainable fashion education hinges on continuous curriculum adaptation, comprehensive integration, and tackling practical challenges within industry and community contexts. The connection between sustainability education and graduate employability in the fashion industry is gaining momentum. At the same time, the fashion sector is facing pressure to adopt sustainable practices due to its environmental and social impacts, with fast fashion accelerating consumption and pollution (Birkocak et al., 2019). As a result, it is imperative to carry out awareness campaigns about ethical and environmental issues as this will enhance sustainable practices in the textile industry (Kumar & Polonsky, 2017). This has, however, influenced skills requirements for industry professionals, emphasizing expertise in sustainable materials, circular economy principles and ethical responsibility. Graduates with sustainability education are increasingly in demand as the industry shifts. To meet the UNSDG's goals, the market demands professionals who understand sustainable material sourcing, circular economy practices and supply chain transparency (UNEP, 2021). With sustainability, education is increasingly in demand as the industry shifts. Henninger et al., (2017) argued that companies now prioritize hiring professionals with sustainability knowledge to meet regulatory and consumer-driven demands.

In response, sustainability efforts focus on several key strategies. First, the adoption of eco-friendly materials, such as bio-based textiles and regenerated fibers which reduce environmental impact. While circular economy models such as reparability and textile recycling help extend product life cycle and minimize waste. Furthermore, advancements in supply chain transparency through technologies like blockchain ensure ethical and traceable sourcing. These initiatives align with global sustainability goals while reshaping industry practices. Pedersen and Andersen, (2015) identified scalability challenges in sustainable fashion innovations especially in making eco-friendly materials cost-effective for mass production. Other challenges include consumer engagement and supply chain transparency. In addition, Jia et al., (2020) discuss infrastructure gaps in textile recycling and circular economy initiatives, noting the lack of efficient collection and sorting systems. Despite these challenges, sustainability education equips graduates with skills to meet the fashion industry's evolving demands.

The integration of sustainability into education is reshaping industry standards by equipping professionals with interdisciplinary skills and a holistic understanding of environmental, social and economic factors. Scholars such as Oyedepo et al., (2020) emphasize that sustainability education fosters interdisciplinary abilities essential for addressing complex global challenges.

Furthermore, Hammer and Lewis (2023), highlight that effective sustainability education is not only about knowledge acquisition but also transformative participatory learning experiences. These approaches encourage critical thinking, problem-solving and ethical decision-making which ensure that future professionals align their behaviors with sustainability principles rather than simply learning theoretical concepts. This reinforces the need for active, experiential learning to drive meaningful industry change. Many developing countries depend on low-cost, high-volume fashion production for economic stability, but the dominance of fast fashion, coupled with cost barriers to sustainable materials often prevents professionals from applying sustainability principles learned in school, making eco-friendly production an impractical choice for many small businesses and startups (Leal-Filho et al., 2018).

Assessing the long-term impact of sustainability education on textile students' behavior presents a significant challenge as it requires determining whether the knowledge and values imparted during their studies translate into enduring personal and professional practices. Moreover, meaningful behavioral changes take years to materialize especially during the transition from education to career (Perez et al., 2022). Barth et al., (2007) highlight the difficulty of measuring the lasting effects of education for sustainable development (ESD), emphasizing those substantial changes in professional practices may only become apparent over time. Moreover, Fisher and McAdams., (2021) emphasize the importance of follow-up studies to track behavioral shifts as students' advance in their careers, highlighting the limitations of self-reported data in accurately capturing these changes. This underscores the need for more comprehensive methods to evaluate the lasting effects of sustainability education over time.

Measuring these changes is complex, with self-reported data prone to bias and objective measures not always capturing underlying motivations. The Theory of Planned Behavior suggests that attitudes, social norms and perceived behavioral control influence sustainability-related actions. At the same time, the Value-Belief-Norm (VBN) Theory highlights the role of personal values and ecological awareness in driving pro-environmental behavior (Steg and Van den Bergh., 2020). As such, sustainability education which fosters strong environmental values may lead to more enduring shifts in behavior thereby influencing both industry practices and individual consumption habits.

3. Conclusion

Integrating sustainable practices into textile and apparel education in developing countries is essential to addressing environmental and socioeconomic challenges. This review emphasized the importance of integrating sustainability into curricula to prepare future professionals for a more environmentally friendly industry. While awareness of sustainability in education is increasing, challenges such as resource constraints, outdated curricula and insufficient institutional support remain. An effective integration requires a comprehensive approach that includes policy support, collaboration between academia and industry as well as access to modern technology. In future, efforts should focus on developing comprehensive, interdisciplinary curricula that not only teach sustainability concepts but also ensure their practical application through hands-on training and collaborations with industry.

Recommendations

Sustainable practices in textile and fashion education are essential for environmental responsibility and innovation. The review outlined key strategies to help students reduce waste, use eco-friendly materials and follow ethical production methods. Hence, the recommendations given below focus on curriculum development, industry collaboration and hands-on learning to improve sustainability education in developing countries. By connecting theory with practice, these strategies when adopted will seek to prepare future textile and fashion dealers for a more sustainable industry.

- **Curriculum development** - institutions should update existing curricula to include sustainability concepts, life-cycle analysis and circular economy principles in textile and apparel education.
- **Industry collaboration** - stronger partnerships should be established between academic institutions and industry players to provide students with practical experience in sustainable practices.
- **Government and organizational support** - governments and organizations should provide funding, incentives and policy frameworks to encourage the adoption of sustainability in education.
- **Technology integration** - institutions should invest in modern equipment and digital tools to enhance learning experiences related to sustainable production techniques.
- **Capacity building** - educators should receive training programs to ensure they have the necessary expertise to effectively deliver sustainability-focused courses.
- **Awareness and promotion** - educational campaigns and community engagement initiatives should be promoted to increase awareness of sustainable practices among students and industry stakeholders.
- **Monitoring and evaluation** - institutions should implement monitoring systems to assess the effectiveness of sustainability programs and make continuous improvements based on feedback and industry needs.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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