

# Pedagogical Approaches for Sustainable Fashion Design Curriculum: A Systematic Literature Review

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## Abstract

Teachers' pedagogical approach significantly contributes to ensuring the quality of sustainability education, facilitating the achievement of learning outcomes. The heightened demand for sustainable fashion design necessitates integrating sustainability education into the curriculum, preparing future fashion designers with the knowledge and skills required by the current industry. Despite numerous studies on sustainable practices in fashion design education, there remains a gap in systematic literature reviews addressing the pedagogical approach implemented in the fashion design curriculum. Thus, this systematic literature review highlights and discusses the pedagogical approaches and teaching methods employed in implementing sustainability education in fashion design curriculum. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) method was used to analyze articles from the SCOPUS, ERIC, and AASHE databases. A comprehensive electronic database search using keywords and search strings yielded 134 publications between 2019 and 2023, all written in English, and only 12 articles were selected based on the established criteria. The findings indicate a preference for experience-based learning and project-based learning approaches in implementing sustainable fashion design courses. This provides a direction for future research to further explore the possibilities of other pedagogical approaches to enhance the implementation of sustainable fashion design courses.

**Keywords:** Sustainable Fashion Design, Fashion Design Curriculum, Education for Sustainable Development (ESD), Pedagogical Approach, Teaching Methods

## Introduction

The pollution the fashion industry generates has become a pressing environmental concern that necessitates immediate attention and action. Today, the fashion industry is one of the world's most polluting and exploitative sectors Mizrachi & Tal ( 2022), significantly contributing to environmental degradation (Islam et al., 2020). The fashion industry in Malaysia is expanding and is recognised as a significant economic sector in the Malaysian Standard Industrial Classification (MSIC, 2008). This has led to the accumulation of 600,000 kg of textile waste over 22 months in the Klang Valley, Negeri Sembilan, and Melaka, according to the data from Kloth Cares (SWCorp Malaysia, 2020). This situation poses a severe threat to the environment and requires urgent containment. To address this concern,

individuals must possess awareness, knowledge, skills, and values supporting sustainable development. Educational institutions play a crucial role in fostering such capabilities through sustainability education (Chinedu et al., 2023).

As part of the sustainable development initiative, the United Nations introduced the Sustainable Development Goals (SDGs) in 2015, aiming to eradicate poverty, protect the earth, and ensure universal peace and well-being (United Nations, 2015). Education for Sustainable Development (ESD) was subsequently integrated into the fourth SDG goal of quality education, providing a guiding framework for curriculum integration (Chinedu et al., 2023). ESD encourages a holistic approach, fostering critical thinking, problem-solving abilities, and a sense of responsibility for environmental and social issues among students (Bennetta & Hill, 2022). Furthermore, by incorporating ESD principles into the fashion design curriculum, educational institutions can cultivate a new generation of fashion professionals. These individuals will understand the entire life cycle of clothing, from material sources to end-of-life disposal, prioritizing sustainable and ethical practices throughout the garment design and manufacturing process (Baeza & Quinn, 2021).

However, several issues must be addressed in the implementation of sustainability education within the fashion design curriculum. Concerns identified in previous studies reveal that students often resist change and need more motivation due to perceiving sustainable actions as challenging to implement and lacking support in daily life (Jestratijevec & Hillery, 2023). Moreover, teenagers frequently lack concern for sustainability in their consumption behaviors (Becker-Leifhold & Hirscher, 2019). Hence, Shephard and Pookulangara (2022) posit that Generation Z students, considered future change agents, must be exposed to and embrace the concept of sustainable fashion within the educational curriculum.

Incorporating sustainability education into the fashion design curriculum holds significance within the educational context. With the growing awareness of environmental issues in the fashion industry, numerous practitioners and researchers have emphasized the need for a 21st-century pedagogical approach to implementing sustainability education (Agarwal, 2021; Choi, 2019; Lin, 2021; Murzyn-Kupisz & Holuj, 2021). To ensure the successful implementation of sustainability education, the pedagogical approach must be interactive, project-based, and student-centered (UNESCO, 2020). Instituting a comprehensive institutional-wide approach to Education for Sustainable Development (ESD) transforms all aspects of the learning environment, enabling students to comprehend their lessons and internalize sustainable practices (UNESCO, 2020). This transformative approach indirectly aligns with the objective of sustainability education, equipping students with the knowledge, skills, and attitudes necessary for sustainable and ethical fashion practices (Murzyn-Kupisz & Holuj, 2021).

Despite the various pedagogical approaches in sustainability education, a more systematic literature study must be specific to the fashion design curriculum. Responding urgently to the environmental and social challenges the fashion industry poses, integrating sustainability education into the art of fashion design is imperative (Murzyn-Kupisz & Holuj, 2021). Despite the growing awareness of the importance of sustainability education, comprehensive guidelines and pedagogical approaches for its implementation in the fashion design curriculum still inadequate. To address this gap, this study focuses on a systematic literature review to identify the pedagogical approaches employed by educators in implementing sustainability education in fashion design. This study aims to contribute recommendations for relevant pedagogical approaches to the educational implementation of fashion sustainability, indirectly enhancing sustainable practices and bridging the gap

between the impact of the fashion industry and the educational curriculum. Hence, this systematic literature review has two primary objectives:

- i. Identify the pedagogical approaches used in implementing sustainability education in fashion design and
- ii. Identify the teaching methods used in implementing sustainability education in fashion design.

To address these objectives, two key questions are examined

- i. What pedagogical approaches are utilized in implementing sustainability education in fashion design?
- ii. What teaching methods are employed in implementing sustainability education in fashion design?

### Methodology

A systematic literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 method to critically analyse the relevant articles for this study. This process involves three phases: (i) identification, (ii) screening, and (iii) inclusion of articles. The researchers initiated the process by formulating research questions and searching for articles related to pedagogical approaches in the implementation of fashion sustainability (Mengist et al., 2020). Specifically, this study is aimed at reviewing articles that explore pedagogical approaches to ESD integration in fashion design curricula.

### Article Search Strategy

The analysis in this study involved articles from: a) SCOPUS, a comprehensive high-impact database; b) The Education Resources Information Center (ERIC), dedicated to gathering research and information in the education field, and c) The Association for the Advancement of Sustainability in Higher Education (AASHE), providing scholarly resources related to sustainability curricula. Two crucial criteria for this study are the teaching approach and fashion sustainability. Thus, relevant publications in English were searched using the keywords "sustainable fashion education" and "pedagogy approach." Synonymous terms related to these keywords were discovered, and Boolean operators were used to create search strings. The search string employed for the exploration of related articles is detailed in Table 1.

Table 1

*Keywords and databases used in article search*

Databases	Keywords used	Identification Phase	Included Phase
SCOPUS	TITLE-ABS-KEY ("sustainability" AND "education" AND "fashion" AND "pedagog* approach" OR "learning" OR "climate")	48	9
ERIC	"sustainability" AND "education" AND "fashion" OR "learning"	31	1
AASHE	"sustainability AND "education" AND "fashion" OR "learning"	55	2
	Number of articles obtained	134	12

### Article Selection Criteria

The study's article selection criteria limit the inclusion of articles to those authored in English and published between 2019 and 2023. The decision of concentrating on English publications is intended to enhance comprehension and examination of the material. Restricting the search to the last five years ensures that the research articles included will focus on the most current topics in the field of research. Only articles with open access, primarily focusing on empirical investigations in sustainable fashion education, were included. However, proceedings, conference papers, theses, and books were not included in the selection process. The eligibility and exclusion criteria for articles in this selection are outlined in Table 2.

Table 2

#### *The eligibility and exclusion criteria*

Criteria	Eligibility	Exclusion
Year of issue	<b>Between 2019 to 2023</b>	<b>2018 and earlier</b>
Language	<b>English</b>	<b>Non-English</b>
Literature type	<b>Journal (research articles)</b>	<b>Thesis, proceedings, conferences, books</b>
Areas of study	<b>Fashion sustainability</b>	<b>Other than fashion sustainability</b>

### Article Selection Process

Referring to Figure 1, the identification phase yielded 134 articles retrieved from three databases using designated search keywords. Articles were screened based on rejection criteria that excluded those published before 2019, not in English, theses, proceedings, conferences, and books. This phase resulted in decreasing the number of articles to 31. The filtering process further eliminated articles without full text ( $n = 10$ ). Four of the remaining 21 articles were duplicates, and additional articles were excluded for failing to meet the study's contextual criteria, amounting to 5 articles. Ultimately, a total of 12 articles were chosen for the execution of this systematic literature review.

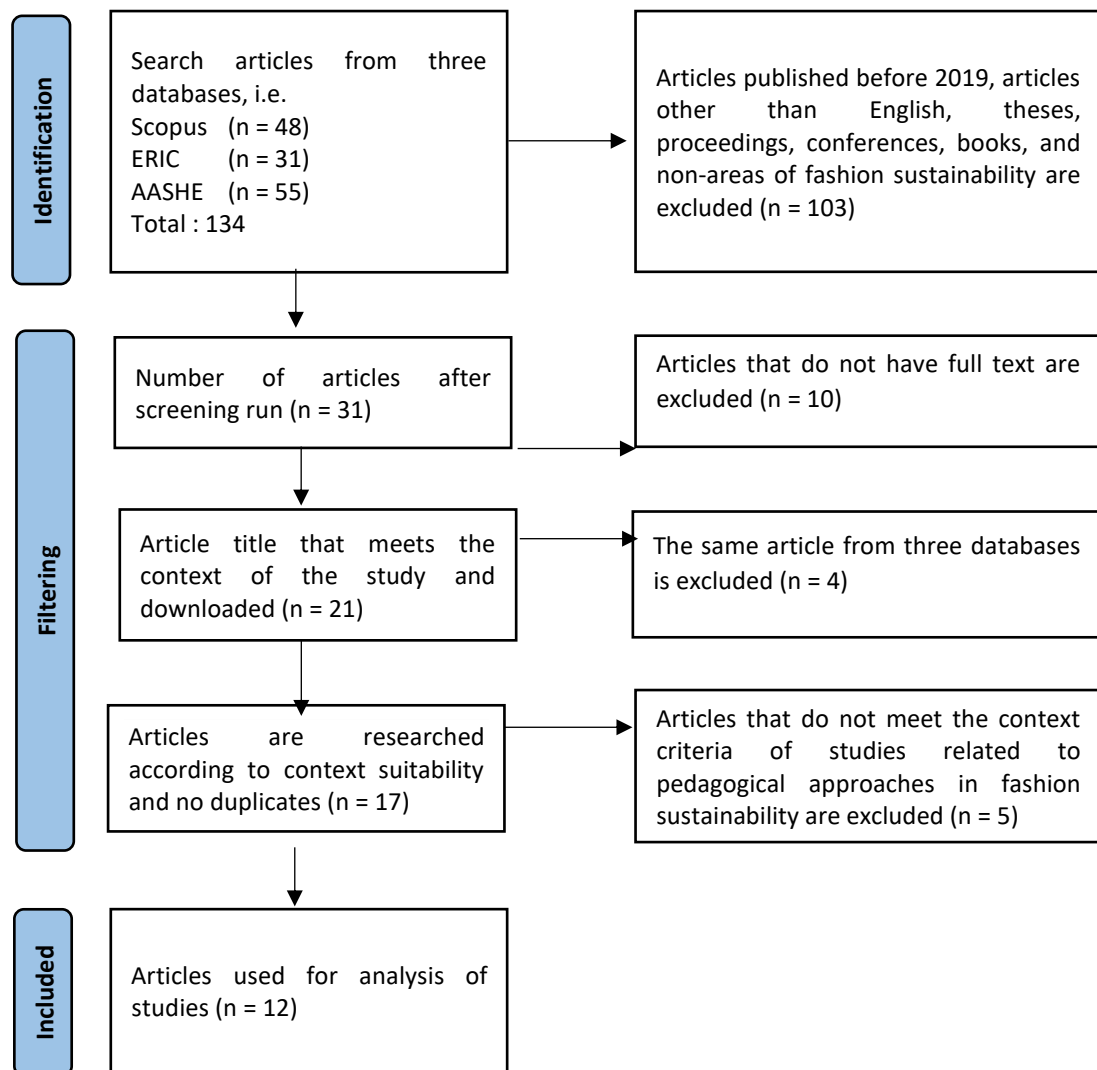


Figure 1. Article selection flow using the PRISMA 2020 protocol  
Adaptation from Page et al (2020)

### Data Collection and Data Analysis

The data collection process involved the 12 articles selected through the article selection phase from three databases: SCOPUS, ERIC, and AASHE. Relevant data, including the title, author's name, publication year, and the pedagogical approach employed in each study, were systematically extracted and organized into a table to streamline the synthesis process. The qualitative synthesis used thematic analysis to categorize teaching methods based on the pedagogical approach to fashion sustainability. The data analysis outcomes are presented comprehensively in tables and pie charts, offering a visual representation of the synthesized information. Furthermore, Table 3 provides a comprehensive list of past study articles, including the authors' names, their respective countries, and the study designs employed in each article. This detailed compilation enhances transparency and aids readers in understanding the breadth and depth of the selected literature for this systematic literature review.

Table 3

*List of past study articles*

No	Author/ Country	Year/ Method	Study Method	Study Title
A1	<b>Murzyn-Kupisz, &amp; Hołuj (2021) - Poland</b>	QT		Fashion Design Education and Sustainability: Towards an Equilibrium between Craftsmanship and Artistic and Business Skills?
A2	<b>Ma (2022) - Korea</b>	QL		Development of education for sustainable fashion design using a challenge-based learning approach
A3	Wood et al. (2022) – United Kingdom	QL		Developing textile sustainability education in the curriculum: pedagogical approaches to material innovation in fashion.
A4	<b>Agarwal (2021) - Dubai</b>	QL		Integration of Sustainable Practices in Fashion Design Education: An Experimental Study Based on Experiential Learning
A5	<b>Gam &amp; Banning (2020) - USA</b>	QT		Teaching Sustainability in Fashion Design Courses Through a Zero-Waste Design Project
A6	<b>Jones &amp; Podpadec (2023) - United Kingdom</b>	QT		Young people, climate change and fast fashion futures
A7	<b>Choi (2019) - Korea</b>	MM		Eco-tech fashion project: collaborative design process using problem-based learning
A8	<b>Lin (2021) - India</b>	QL		Sustainable Fashion Design Education: The Studio-based Approach
A9	<b>Jestratišević &amp; Hillery (2023) - USA</b>	MM		Measuring the “Clothing Mountain”: Action Research and Sustainability Pedagogy to Reframe (Un)Sustainable Clothing Consumption in the Classroom
A10	<b>Becker-Leifhold &amp; Hirscher (2019) - Germany</b>	MM		Fashion Libraries as a Means for Sustainability Education—An Exploratory Case Study of Adolescents’ Consumer Culture
A11	<b>Shephard &amp; Pookulangara (2022) - USA</b>	QT		Teaching slow fashion: an inquiry-based pedagogical approach
A12	<b>Agarwal (2023) - India</b>	QL		Sustainable Fashion Education: Future Design and Pedagogy

(QT = quantitative; QL = qualitative; MM = mixed method)

## Results

Following the three phases of article selection in this systematic literature review, a total of 12 articles were identified, meeting the primary objective of the study: to identify the pedagogical approach for the implementation of fashion sustainability education. Additionally, the study revealed the teaching methods associated with the pedagogical approach to fashion sustainability education. The ensuing sections provide a comprehensive

presentation and analysis of the findings, shedding light on the diverse pedagogical strategies employed in fashion sustainability education.

### Pedagogical Approach for the Implementation of Sustainable Fashion Design Education

The pedagogical approach in implementing sustainability education for fashion design aims to instigate transformative changes in students' values, beliefs, and behaviors, fostering a comprehensive understanding of and engagement with holistic environmental, sociocultural, and economic shifts (Jestratijevic & Hillery, 2023). As pivotal agents in implementation, teachers are crucial in identifying suitable pedagogical approaches for fashion sustainability education (Burns et al., 2019).

Upon analyzing the selected articles, ten practical pedagogical approaches have emerged as strategies for delivering fashion sustainability education. These approaches encompass value-based learning, challenge-based learning, experiential learning, project-based learning, innovative art-based learning, problem-based learning, studio-based learning, Sustainability Pedagogical Burns Model, inquiry-based learning, and interdisciplinary approaches, each with an occurrence of ( $n=1$ ). Experience-based learning (17%,  $n=2$ ) and project-based learning (17%,  $n=2$ ) emerge as the preferred pedagogical approaches. The study's findings regarding the pedagogical approach for implementing fashion sustainability education are visually represented in Figure 2. This depiction aids in comprehending the prevalence and distribution of various pedagogical approaches, providing valuable insights into the diverse educational strategies employed within this context.

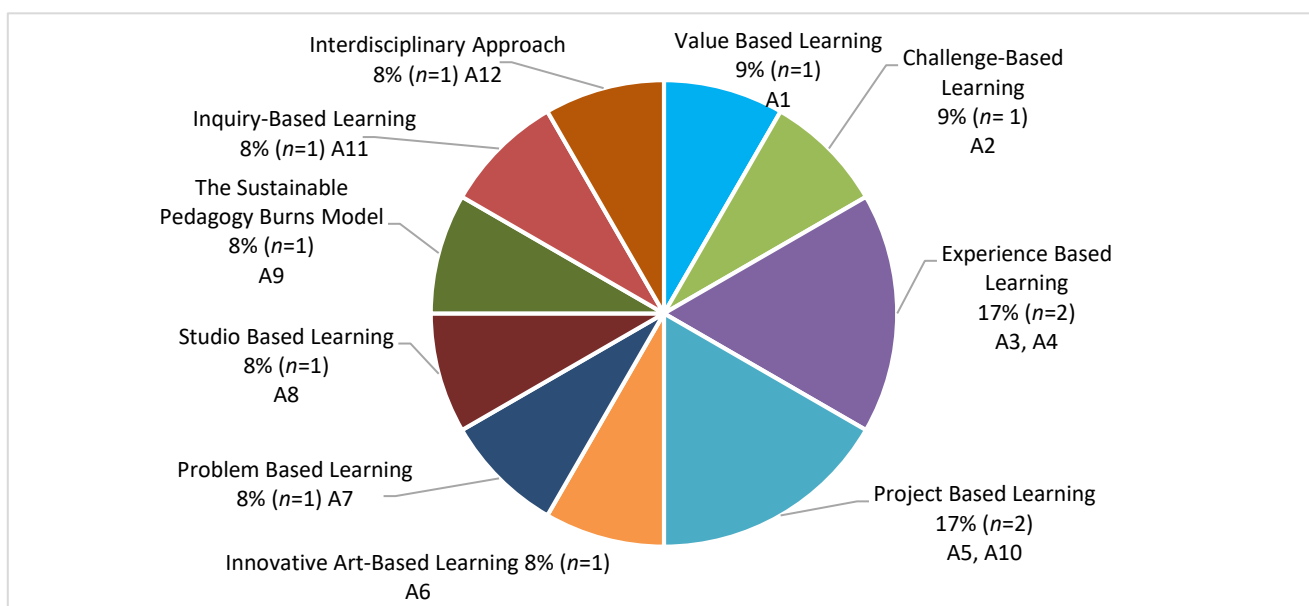


Figure 2. Pedagogical approach in the implementation of sustainable fashion design education

A brief description related to each finding of the pedagogical approach based on article analysis is explained in Table 4.

Table 4

*Description of pedagogical approach in the implementation of sustainable fashion design education*

<b>Pedagogical Approach</b>	<b>Description</b>
<i>Experience-Based Learning</i>	<ul style="list-style-type: none"> <li>• Learning through experience, reflection and action.</li> <li>• Incorporates Kolb's Experience Learning Model.</li> <li>• Utilizes experience applications like zero-waste projects.</li> </ul>
<i>Project-Based Learning</i>	<ul style="list-style-type: none"> <li>• Active approach for effective knowledge acquisition.</li> <li>• Collaborative, inquiry-based, student-centered, and self-directed engagement.</li> <li>• Applied to learning the principles of fashion sustainability, especially zero-waste design concepts.</li> </ul>
<i>Value-Based Learning</i>	<ul style="list-style-type: none"> <li>• Shift from "product and designer" focus to "value and design process".</li> <li>• Multidisciplinary and project based.</li> <li>• Emphasis on leadership skills and reflexive learning.</li> </ul>
<i>Challenge-Based Learning</i>	<ul style="list-style-type: none"> <li>• Self-achievement through proposing and implementing problem-solving initiatives.</li> <li>• Emphasizes sequential procedures, investigations and solutions recommendations.</li> </ul>
<i>Innovative Art-Based Learning</i>	<ul style="list-style-type: none"> <li>• Action pedagogy fostering a constructive environment for creative exploration of ideas, beliefs, and actions.</li> <li>• Emphasizes positive actions and changes in the context of sustainability.</li> </ul>
<i>Problem-Based Learning</i>	<ul style="list-style-type: none"> <li>• Collaborative process where students learn problem-solving skills through student-centered, integrated problems.</li> </ul>
<i>Studio-Based Learning</i>	<ul style="list-style-type: none"> <li>• Provides a creative environment encouraging experimentation with new ideas.</li> <li>• Emphasizes the learning process over the outcome.</li> <li>• Utilizes zero-waste method during the design process, creating sustainable and contemporary designs.</li> </ul>
<i>Sustainability Pedagogy Model</i>	<ul style="list-style-type: none"> <li>• Used in transformative learning, examines unsustainable clothing consumption behaviours.</li> <li>• Five primary dimensions consists of design, content, perspective, processes and contexts.</li> </ul>
<i>Inquiry-Based Learning</i>	<ul style="list-style-type: none"> <li>• Necessitates active student involvement in question and answer sessions, information gathering, and concluding a topic.</li> <li>• Encourages discovering new cause-and effect relationships and problem-solving through relevant skills.</li> </ul>
<i>Interdisciplinary Approach</i>	<ul style="list-style-type: none"> <li>• Advocates curriculum changes, and interdisciplinarity approaches in fashion design.</li> <li>• Emphasizes human-centered design, empathic design thinking, handmade products and a "6Rs" approach.</li> </ul>



### **Experience-Based Learning**

Drawing from the Kolb Experience Learning Model, experience-based learning involves learning through experience, reflection, and action (Wood et al., 2022). Embracing new ideas aligns with Kolb's learning cycle, indicating that students are likelier to engage with proposed ideas. Additionally, students' varying experiences, knowledge, and skill levels lead to diverse outcomes from the same stimulus, shaped by practical engagement and experience (Agarwal, 2021). Exploring experience applications, such as zero-waste projects, aims to integrate sustainable practices into the existing curriculum, allowing students to share their experiences while developing projects.

### **Project-Based Learning**

Project-based learning is a flexible approach that promotes efficient learning in real-world scenarios. Utilised through collaborative, inquiry-based, student-centered, and self-directed engagement, this approach is especially pertinent for learning about fashion sustainability principles, particularly when including zero-waste design concepts (Gam & Banning, 2020). This method is suggested as a resolution for practical sustainability issues faced by students (Becker-Leifhold & Hirscher, 2019). Practical learning experiences let students acquire hands-on experience, connecting theory with practice in sustainable fashion projects. Students engage in a range of learning activities, including lectures, recycling workshops, public speaking, exhibitions, and local newspaper reporting, to build sustainability strategies and address future concerns in fashion sustainability.

### **Value-Based Learning**

Value-based learning advocates a shift from a 'product and designer' focus to highlighting the 'value and design process' in fashion education. This approach integrates a multidisciplinary and project-based framework. Furthermore, developing leadership skills is crucial, encompassing the ability to create and inspire vision, exemplify and motivate behavior, drive desired change, and inspire others. With this paradigm shift in the fashion industry, fashion education should also undergo a transformative shift, particularly toward reflexive learning (Murzyn-Kupisz & Holuj, 2021).

### **Challenge-Based Learning**

Challenge-based learning, a variant of project-based learning, centers on self-achievement through proposing and implementing problem-solving initiatives. Particularly suited for fashion sustainability, this approach emphasizes sequential procedures, investigations, and solution recommendations. It offers a model that encourages students to contemplate and address diverse issues in fashion sustainability challenges, guiding them to propose actionable solutions. A multidisciplinary approach is essential for developing solutions, considering the complexity inherent in sustainability pillars. Implementation of challenge-based learning involves teaching activities such as fieldwork, ethnographic research, artistic inspiration, and experiments across various disciplines (Ma, 2022).

### **Innovative Art-Based Learning**

Innovative art-based learning, incorporating action pedagogy, assists young individuals in envisioning a sustainable future in the fashion industry. Differing from passive methods, this pedagogy fosters a constructive environment where collaborative and creative exploration of ideas, beliefs, and actions occurs. Emphasizing positive actions and changes, this approach

directs attention to practical activities directly impacting sustainability. The goal is to empower students as current and future change agents, fostering a deeper understanding of the correlation between the fast fashion industry and climate change. Workshops and film screenings exploring the relationship between fast fashion and climate change can enhance students' skills in clothing repair, thereby heightening awareness and desire for fashion sustainability (Jones & Podpadec, 2023).

### ***Problem-Based Learning***

Problem-based learning is a collaborative process wherein students learn problem-solving skills through student-centered, integrated problems. This method involves solving real-world problems, such as creating creative recycled fashion products, utilizing digital technology in product integration, and forming inter-industry and interdisciplinary collaborations. Applied explicitly to nurture holistic design thinking and problem-solving skills among fashion designers or potential entrepreneurs, this approach is integral to a collaborative fashion design process, enabling students to address real-world sustainability issues in the fashion industry (Choi, 2019).

### ***Studio-based learning***

In Lin's study (2021), studio-based learning provided students with a creative environment that encouraged experimentation with new ideas. Emphasizing the learning process over the outcome, this framework encourages students' active participation in the learning procedure. The aim is to train future fashion designers as change agents, focusing on sustainable fashion practices. Utilizing the zero-waste method during the design process, this approach creates sustainable and contemporary designs, as demonstrated in the production of traditional Indian sarees. Integrating informal educational activities, such as scientific visits, can enhance students' learning motivation and interest in sustainable fashion.

### ***The Sustainability Pedagogy Burns Model***

The Sustainability Pedagogy Burns model, used in transformative learning, examines unsustainable clothing consumption behaviors. Jestratijevic and Hillery's study (2023) employs this model with five primary dimensions: design, content, perspective, processes, and contexts, unveiling sustainable practices associated with human behavior and industrial development. Over one semester, students identify changes in sustainable clothing use behaviors through practices like clothing rental, exchange, recycling, resale, and repair.

### ***Inquiry-Based Learning***

Inquiry-based learning necessitates active student involvement in question-and-answer sessions, information gathering, and concluding a topic. This approach encourages discovering new cause-and-effect relationships and problem-solving by applying relevant skills. Teachers formulate questions, and students take a more self-directed approach to their inquiry. In Shephard and Pookulangara's study (2021), inquiry-based learning is a practical approach focused on sustainability, exposing students to real-world problems.

### ***Interdisciplinary Approach***

Agarwal's study (2023) advocates curriculum changes in fashion design, introducing more theories, techniques, methodologies, and interdisciplinary approaches. Integrating sustainable fashion design principles equips students with contextual and cross-disciplinary

knowledge, exposing them to real-world problems. This approach can stimulate new job profiles, innovation with sustainability, and efficient technology use. The interdisciplinary approach emphasizes human-centered design, empathic design thinking, handmade products, and a "6Rs" approach.

### Teaching Methods in the Implementation of Sustainable Fashion Design Education

The second objective of this study is to identify the teaching methods applied in implementing the pedagogical approach to fashion sustainability education. The integration of various teaching methods with a pedagogical approach entails delivering sustainability education content in the fashion design field. Researchers have identified teaching methods as a central theme with three main subthemes: interactive learning, project-based, and student-centered. A brief description of the teaching method based on article analysis is explained in Table 5 and each major subtheme aligns with teaching methods as detailed in Table 6.

Table 5

*Description of teaching method*

<b>Teaching Method</b>	<b>Description</b>
<i>Interactive Learning</i>	Interactive learning fosters collaboration among students, teachers, and industry players through engaging methods. It utilizes feedback sharing, discussions, and interactive environments to create a collective discovery atmosphere. This method often integrates technology, industry collaboration, and seminars to enhance sustainability education in fashion design.
<i>Project-Based</i>	Project-based is an active, inquiry-based approach emphasizing effective real-world knowledge acquisition. It involves collaborative, student-centered, and self-directed engagement with hands-on experiences. In fashion sustainability education, project-based includes various approaches such as prototype development, zero-waste projects, and real-world learning facilitated by digital technology and practical projects.
<i>Student-Centered</i>	Student-centered places students at the core, fostering self-assessment, exploration, and reflection. In fashion sustainability education, it often includes multidisciplinary and experiential learning, empowering students to develop ideas and critical thinking through activities like workshops, field trips, and interactive dialogue.

Table 6

*Teaching methods based on interactive, project-based, and student-centered learning*

No.	Author/ Year	Teaching Methods		
		Interactive Learning	Project-Based	Student-centered
A1	<b>Murzyn-Kupisz, &amp; Hołuj (2021)</b>	Information Sharing Collaborative with industry Use of technology	Artistic Creative Haute couture project	Self-assessment Multidisciplinary approach
A2	<b>Ma (2022)</b>	Peer feedback Presentation	Prototype construction Testing	Self-exploration Self-assessment Documentation
A3	Wood et al. (2022)	Discussion Discussion	Project development through science practice	Self-reflection
A4	<b>Agarwal (2021)</b>	Peer feedback Collaborative Appoint teachers	Application of practical theory Practical projects Problem-solving Real-world learning	Self-reflection Self-assessment Individual approach Self-motivation
A5	<b>Gam &amp; Banning (2020)</b>	Collaborative Reflective analysis Community-based projects	Zero waste project Problem-solving	Self-directed learning Professional development Feedback and evaluation
A6	<b>Jones &amp; Podpadec (2023)</b>	Workshop	Sewing patches	Give the opinion
A7	<b>Choi (2019)</b>	Professional lectures Group discussions Collaborative with industry Feedback session	Multi-dimensional idea design Collaboration with the sewing industry Using 3D digital technology Troubleshooting in the real world	Self-learning Study findings Presentation of ideas Self-exploration Critical thinking skills
A8	<b>Lin (2021)</b>	Field trips Depiction Exhibition Peer feedback	Concept building Construction of an inspiration board Prototype construction	Create a sketch Active learning
A9	<b>Jestratijevic &amp; Hillery (2023)</b>	Constructive conversations	Research Measure the amount of clothing bought, used, and thrown away	Experience-based learning Written reflection

No.	Author/ Year	Teaching Methods		
		Interactive Learning	Project-Based	Student-centered
A10	<b>Becker-Leifhold &amp; Hirscher (2019)</b>	Active and interactive dialogue Collaborative Workshop Lecture Discussion	Zero waste design project Approach problem-solving through building, organizing, and managing Exhibition	Exploration Role-playing games Interview Fashion Library Operations Workshop
A11	<b>Shephard &amp; Pookulangara (2021)</b>	Group discussions Using technology	Orientation Conceptualization Investigation Conclusion Discussion	Inquiry-based learning Research Working paper
A12	<b>Agarwal (2023)</b>	Discussion Professional seminar or workshop	Using recycled materials and techniques Design of advanced industrial projects Real-world learning	Combined learning medium Research in various disciplines Interaction between faculty and students

### Interactive Learning

As a teaching method, interactive learning proves to be a positive approach to delivering fashion sustainability education within the pedagogical framework. It fosters a collaborative environment where students, teachers, and industry players share information and ideas, leading to collective discoveries. Studies conducted by Agarwal (2021); Choi (2019); Lin (2021); Ma (2022); Murzyn-Kupisz & Holuj (2021) utilize feedback-sharing methods among classmates, information discussions, and interactive learning environments. Additionally, collaboration with the industry Choi (2019); Murzyn-Kupisz & Holuj (2021), technology usage Murzyn-Kupisz & Holuj (2021); Shephard & Pookulangara (2021), and seminars or workshops Agarwal (2023); Becker-Leifhold & Hirscher (2019); Jones & Podpadek (2023) also incorporates interactive learning in the implementation of sustainability education in the fashion design curriculum.

### Project-Based

Project-based teaching methods emerge as the most widely utilized in the selected literature. Various approaches are employed to produce projects that effectively deliver fashion sustainability education. Methods include prototype development Ma (2022); Lin (2021), construction of sustainable fashion concept projects like haute couture projects Murzyn-Kupisz & Holuj (2021), zero-waste projects Agarwal (2023); Gam & Banning (2020); Jestratijevic & Hillery (2023), and science practice (Wood et al., 2022). Alongside project production, students have the opportunity for real-world learning experiences Agarwal (2021); Agarwal (2023); Choi (2019) using digital technology (Choi, 2019). The project implementation nurtures students' problem-solving skills in the context of fashion sustainability to address

real-world challenges (Agarwal, 2021; Becker-Leifhold & Hirscher, 2019; Choi, 2019; Gam & Banning, 2020).

### **Student-centered**

Aligned with UNESCO's (2020) commitment to student-centered sustainability education, selected literature findings highlight that teachers can implement various methods to apply student-centered teaching approaches. Students are encouraged to engage in self-assessment in applying fashion sustainability education Agarwal (2021); Ma (2022); Murzyn-Kupisz & Holuj (2021) through self-exploration (Agarwal, 2021; Choi, 2019; Becker-Leifhold & Hirscher, 2019; Ma, 2022). Self-reflection activities Agarwal (2021); Jestratijevic & Hillery (2023); Wood et al (2022) related to sustainable fashion allow students to receive feedback and evaluate their projects (Gam & Banning, 2020). Multidisciplinary interrogation (Agarwal, 2023; Murzyn-Kupisz & Holuj, 2021), shaping critical thinking skills Choi (2019), and creating an active learning environment Becker-Leifhold & Hirscher (2019); Lin (2021) promote student-centered teaching methods in delivering fashion sustainability education.

### **Discussion**

This systematic literature review analyzes literature published in English over the past five years related to pedagogical approaches and teaching methods to implement sustainability in the fashion design curriculum. Overall, this study reveals various pedagogical approach practices and teaching methods teachers implement in implementing sustainability practices in teaching fashion design. The results of the study have found as many as ten pedagogical approaches teachers use in implementing sustainability based on fashion design curriculum and teaching methods consisting of interactive learning, project-based, and student-centered. The findings of this literature review also reveal various key competencies that can be cultivated in students through different pedagogical approaches in addition to skills related to sustainability to face the future in practising a sustainable lifestyle. Teachers play a crucial role in ensuring students acquire knowledge, skills, and values about sustainability practices, as this generation is envisioned to be the transformative force in the fashion industry (Agarwal, 2023; Becker-Leifhold & Hirscher, 2019).

Based on the literature review, project-based learning is one of the most widely adopted pedagogical approaches because of its ability to develop key competencies for sustainable development. This approach fosters practical experiences that connect knowledge with action in sustainability practices Becker-Leifhold & Hirscher (2019); Gam & Banning (2020); Shephard & Pookulangara (2021) as well as encourages critical thinking and problem-solving skills among students (Choi, 2019; Agarwal, 2021; Becker-Leifhold & Hirscher, 2019; Gam & Banning, 2020). The Fashion Library project, as an example, integrates project-based learning with interactive lectures, successfully implementing sustainability education in fashion design and emphasizing constructivism and experience-based research (Becker-Leifhold & Hirscher, 2019; Jestratijevic & Hillery, 2023). Through the implementation of this pedagogical practice, the problem of fashion sustainability can be addressed, which makes it a relevant pedagogy for sustainable fashion education. A project-based approach has been used to teach sustainability through zero-waste design projects, providing a hands-on and practical approach to sustainability education (Gam & Banning, 2020). Moreover, this approach contributes to finding a balance between craftsmanship and artistic and business skills, in line with the multifaceted nature of sustainable fashion education (Murzyn-Kupisz & Hołuj, 2021). Furthermore, in developing the sustainable fashion niche, project-based

learning plays a vital role in facilitating the learning process and the initial development of sustainable fashion entrepreneurs, highlighting its role in nurturing sustainability-focused professionals in the fashion industry (Aboytes & Barth, 2020). Finally, project-based learning also offers a practical approach to sustainability education, improving students' cognitive and socio-emotional skills, which is essential to addressing sustainability challenges in the fashion industry (Vani et al., 2021). This can indirectly form future sustainable fashion designers to meet the needs of the industry.

Another widely employed pedagogical approach is experience-based learning, often utilizing the Kolb learning cycle. This approach encourages students to share ideas and experiences, promoting a deeper understanding of sustainability practices through personal involvement (Agarwal, 2021; Jestratijevic & Hillery, 2023; Wood et al., 2022). Experiential learning emphasises practical experiences, reflection, and active engagement with real-world problems, effectively imparting practical knowledge and skills for real-world scenarios (Agarwal, 2021; Agarwal, 2023; Choi, 2019). The application of experiential learning in sustainability-related projects enhances problem-solving skills (Agarwal (2021); Becker-Leifhold & Hirscher (2019); Choi (2019); Gam & Banning (2020) and fosters subjective attitudes, contributing to a more profound learning experience (Agarwal, 2021; Lin, 2021). Experiential learning can be effectively applied through hands-on activities such as sustainable textile production, pattern-making, and garment construction, enabling students to directly engage with sustainable practices and materials (Azman et al., 2022). This approach facilitates a deep understanding of sustainability concepts by actively participating in sustainable design processes and reflecting on their work's environmental and social implications.

Furthermore, experiential learning in sustainable fashion education extends beyond the classroom to real-world projects, such as implementing sustainable innovation in pattern-making skills (Azman et al., 2022). Engaging in such projects equips students with practical skills and cultivates a sense of responsibility and agency in addressing sustainability challenges (Waddell, 2021). In addition, this approach aligns with developing critical thinking and problem-solving skills, which are essential for addressing complex sustainability issues in the fashion industry (Heinrich et al., 2015; Perkiss et al., 2020). Engaging with sustainability challenges enables students to analyse, evaluate, and propose innovative solutions, promoting sustainable practices in fashion design and production.

Various teaching methods, including interactive learning, have been utilized to ensure the effective implementation of sustainability education in the fashion design curriculum. Interactive learning facilitates constructive engagement among students, teachers, and industry stakeholders, enhancing information sharing and networking for achieving sustainable fashion goals (Becker-Leifhold & Hirscher, 2019; Choi, 2019; Gam & Banning, 2020; Murzyn-Kupisz & Holuj, 2021). In particular, project implementation has emerged as an effective teaching strategy. This approach encourages independent research, facilitates the discovery of new knowledge, and increases student interest in the learning process (Becker-Leifhold & Hirscher, 2019; Choi, 2019; Gam & Banning, 2020). By actively participating in real-world projects, students gain hands-on experience and a deeper understanding of sustainability concepts, reinforcing the practical application of theoretical knowledge. These findings underscore the critical role of interactive learning, particularly project-based approaches, in enhancing the overall effectiveness of sustainability education in fashion design curriculum.

The relationship between the pedagogical approach and the integration of ESD in sustainable fashion design is essential to foster sustainability competence in both teachers and students. By incorporating pedagogical approaches that promote self-reflection, critical thinking, and active engagement with sustainability concepts, educators can help students cultivate a deeper understanding of their values, beliefs, and behaviors about sustainability (Blaga et al., 2022). Experiential learning is one way that can help students develop self-awareness and master ESD that emphasizes practical experience, reflection, and active engagement with real-world problems (Purnama et al., 2022; Agarwal, 2021). This is supported by a study by Abner and Baytar (2019), which states that through applications such as Making from Nike, students can actively evaluate the sustainability of different materials, which leads to a deeper understanding of the environmental implications of their choices. This hands-on approach fosters self-awareness as students reflect on their decision-making process and consider the broader implications of their actions on the environment. By engaging in hands-on activities related to sustainable fashion design, students can develop a deep understanding of sustainability and reflect on their work's environmental and social implications. This process of reflection fosters self-awareness and critical thinking, which are essential for the mastery of ESD (Gam & Banning, 2020; Wood et al., 2022).

In addition, problem-based learning also encourages students to explore and solve real-world sustainability challenges. This approach can increase students' self-awareness by requiring them to critically analyze complex sustainability issues and develop innovative solutions, further contributing to their mastery of ESD (Backer-Leifhold & Hirscher, 2019; Gam & Banning, 2020). This is in line with the findings of Choi's study (2019), which states that through problem-based learning, students are encouraged to reflect on their learning process, consider different perspectives, and critically analyze environmental issues and sustainable practices. This reflective practice fosters self-awareness and a deeper understanding of the complexities of sustainability. Furthermore, integrating transformative learning approaches through the Sustainable Pedagogy Burns Model emphasizes critical reflection and examination of fundamental beliefs and assumptions, which leads to changes in perspective and behavior (Jestratijevic & Hillery, 2023). By engaging in transformative learning experiences, students and teachers can develop a high self-awareness of their values, beliefs, and actions in the context of sustainability, ultimately contributing to the mastery of ESD (Jaakkola et al., 2022).

An interdisciplinary approach also can contribute to self-awareness and mastery of ESD. Students can develop a holistic understanding of sustainability issues by integrating various perspectives from fields such as sociology, psychology, and environmental science and foster self-awareness about the interconnectedness of social, environmental, and economic factors in sustainable fashion design (Agarwal, 2023). Blaga et al (2022) in his study state that by integrating interdisciplinary perspectives and encouraging dialogue and collaboration among students from various backgrounds, a pedagogical approach can foster a holistic understanding of sustainability issues and promote a sense of collective responsibility to create positive change in the fashion industry. Applying mixed technology, conceptual models, and collaborative activities between institutions and the industry has been identified as approaches to promote ESD practices among students (Bedor et al., 2021). This highlights the relevance of interdisciplinary and collaborative approaches in developing sustainability competencies within the specific context of fashion design curriculum.

Through interactive teaching methods emphasizing collaborative learning, collaborative learning can also form self-awareness in mastering ESD. In addition to knowledge and



understanding of environmental and social issues, ESD aims to facilitate attitude and behavior change and promote competence through guiding principles such as self-directed learning, participation and collaboration, problem orientation, and inter- and transdisciplinarity (Bertel et al., 2021). It is proven that the absorption of ESD content can increase awareness and knowledge of ESD among pre- and in-service teachers, highlighting the importance of collaborative processes in fostering ESD awareness (Ferguson et al., 2022). Also, collaborative learning and governance processes have been recognized as necessary for the effective monitoring and evaluation of ESD, emphasizing the value of collaborative research in developing an effective monitoring and evaluation framework for ESD (Didham & Ofei-Manu, 2020). By working collaboratively on sustainability projects and using technology to explore sustainability issues, students can develop a deeper awareness of their role in promoting sustainable practices (Murzyn-Kupisz & Hołuj, 2021).

In conclusion, this systematic literature review provides valuable insights into pedagogical approaches and teaching methods for sustainability education in fashion design. The diverse range of pedagogical approaches and teaching methods demonstrates the multifaceted nature of effective sustainability education. Experiential learning and project-based learning, among other approaches, showcase their effectiveness in achieving learning objectives within fashion sustainability. The study emphasizes the need for comprehensive implementation of project-based learning in fashion sustainability education, aligning with 21st-century learning. However, there is room for improvement, urging further empirical studies in specific contexts, such as Malaysia, to strengthen the findings and guide educators in developing comprehensive guidelines for the ever-evolving field of fashion sustainability education.

## **Conclusion**

This systematic literature review analyzes pedagogical approaches and teaching methods in implementing sustainability education in fashion design. Recognizing the needs of today's society equipped with knowledge and awareness to preserve the environmental ecosystem, the field of fashion design is no exception to playing an essential role in practising sustainability practices. Thus, through fashion education, teachers, as agents of change, need to prepare themselves with the skills of a practical pedagogical approach to delivering sustainable fashion education practices. Several past studies have examined the importance of sustainability education in the context of fashion design curriculum to ensure that the environmental ecosystem is not affected. Thus, the implications of this study are essential for educators, educational institutions, curriculum policymakers, and fashion design students. This is because the findings of this study can help teachers explore, understand, and deal with more environmental sustainability issues in the context of the fashion design curriculum. The study's findings also support teachers' re-coordination of the existing curriculum and planning teaching methods by using an appropriate pedagogical approach to convey the knowledge and skills related to sustainability that students need to face the future fashion industry.

In addition, educational institutions that offer fashion design courses can use the analysis findings of this study as a guideline to plan and implement programs related to the development of teachers' professionalism related to fashion sustainability. The development of teachers' pedagogical knowledge and skills must be carried out continuously and become the practice of the institution to prepare students skilled towards sustainability. The findings of this study can also be a reference for curriculum policymakers to apply sustainability elements in the curriculum in addition to planning related programs to support the

development of sustainability. This study also contributes to students identifying the skills needed to integrate sustainability in fashion design by the industry. This can indirectly increase the marketability and readiness of students to apply the knowledge and skills gained related to sustainability in the fashion industry.

Nevertheless, this study can be improved so that the research findings obtained more widely include various concepts and educational contexts. Empirical research in Malaysia needs to be carried out to study the pedagogical approach implemented in the country's fashion sustainability context. If the latest pedagogical approach is used, it can contribute to the existing literature to improve the effectiveness of the pedagogical approach in implementing sustainability through the fashion design curriculum. In conclusion, the findings of this study can help teachers, educational institutions, curriculum policymakers, and students to implement sustainability practices in fashion education into the existing curriculum by using an appropriate pedagogical approach to produce sustainable fashion designers of the future to achieve the goals of SGDs towards 2030.

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