

Students' Perceptions of Zero Waste Innovation in Contemporary Kain Jarik and Sarong Design as a Means of Preserving Ethnic Fashion

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Abstract

The global fashion industry faces significant sustainability challenges due to the high volume of textile waste. Zero waste design emerges as a solution by creating garments that minimize fabric remnants. In the Indonesian context, the implementation of this concept becomes particularly relevant when integrated with traditional ethnic clothing, such as kain jarik and sarong, which hold high cultural value but are increasingly underutilized in the modern era. This innovation is expected to simultaneously reduce waste and preserve cultural heritage. This study aims to analyze understanding, application, challenges, attitudes and perceptions, the linkage with the preservation of ethnic clothing, as well as student feedback on zero waste practices. A quantitative approach with an experimental design was employed, involving 20 Fashion Education students at Universitas Pendidikan Indonesia (UPI) selected through purposive sampling. Data were collected through questionnaires and training documentation, then analyzed descriptively. The findings indicate that students demonstrated a good understanding of zero waste, although technical skills in pattern optimization require further improvement. The application of this principle is perceived as efficient, environmentally friendly, and relevant to the preservation of ethnic clothing, with the main challenges being resource limitations and the need for advanced skills. Students expressed highly positive attitudes, viewing zero waste as both a future trend and a medium for safeguarding cultural identity. The training proved effective in enhancing students' understanding, motivation, and commitment to implementing sustainable design. This study supports the achievement of SDG 12 (Responsible Consumption and Production) and SDG 11 (Sustainable Cities and Communities).

Keywords: Zero Waste, Kain Jarik, Contemporary Sarong, Ethnic Fashion Preservation, Sustainable Development Goals (SDGs)

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INTRODUCTION

The global fashion industry faces pressing challenges in achieving sustainability, particularly in addressing the extensive textile waste generated during production processes. One emerging strategy to mitigate this issue is the adoption of zero waste design, a methodological approach that seeks to minimize or entirely eliminate fabric waste through efficient pattern-making and design innovation (Lyon, 2019). This approach has gained prominence in recent years as fabric waste has been recognized as one of the major contributors to environmental degradation and landfill accumulation (Shen et al., 2013). Consequently, implementing zero waste design constitutes a significant step toward fostering a more sustainable and environmentally responsible fashion production system.

Within the Indonesian context, research on sustainable fashion remains relatively underdeveloped compared to global discourse. Existing studies have predominantly focused on material innovation, slow fashion movements, or community-based production initiatives. However, there is a growing need to position sustainable fashion research within the framework of cultural identity and educational practice, as these dimensions are essential for developing holistic and contextually grounded approaches to sustainability. Indonesia possesses a rich heritage of traditional textiles, such as kain jarik and sarong, which embody cultural symbolism, craftsmanship, and collective identity. Despite their cultural significance, modernization and industrialization have relegated these garments primarily to ceremonial and formal functions, leading to a gradual decline in their everyday relevance. To revitalize these traditions, innovative design strategies that combine sustainability principles with contemporary aesthetics are urgently required. Integrating zero waste design into the development of kain jarik and sarong thus offers a dual potential: reducing textile waste while simultaneously reinforcing the preservation of Indonesia's cultural heritage.

Previous research underscores the critical role of sustainable design innovation in advancing environmentally conscious fashion. Fletcher (2014) asserts that sustainability can be effectively achieved through pattern optimization and the utilization of eco-friendly materials. Similarly, a report by the H&M Foundation (2020) demonstrates that zero waste design substantially reduces unnecessary fabric cutting, contributing to lower levels of textile waste. Moreover, the application of zero waste principles aligns with the United Nations Sustainable Development Goals (SDGs) notably SDG 12 (Responsible Consumption and Production) and SDG 11 (Sustainable Cities and Communities) which emphasize sustainable production systems and the preservation of cultural assets within urban and rural contexts (Salgado & Larsson, 2019).

Despite these advancements, a significant research gap remains. Scholarly work exploring the intersection of zero waste design and ethnic textile preservation within fashion education in Indonesia is still limited. Most existing studies have focused on industrial or artisan-based applications, neglecting the educational setting where future designers are trained to integrate sustainability into creative practice. Addressing this gap is crucial, as fashion education serves as a transformative platform for cultivating sustainability awareness, technical competence, and cultural sensitivity among emerging designers.

In response to this gap, the present study examines the understanding, attitudes, and experiences of Fashion Education students at Universitas Pendidikan Indonesia (UPI) in implementing zero waste principles in the design of kain jarik. The research involved a combination of training sessions and practical design exercises aimed at encouraging students to develop zero waste patterns while reflecting on the challenges, benefits, and cultural relevance of these practices. Data were collected through questionnaires evaluating students' knowledge and perceptions, supported by documentation of their design outputs that demonstrate the application of zero waste methods.

The novelty of this study lies in its integration of zero waste design principles within the framework of Indonesian ethnic fashion, focusing specifically on kain jarik and sarong, which have received limited scholarly attention. Beyond its technical implications, this research contributes to the discourse on sustainable fashion education by exploring how design pedagogy can foster environmental consciousness and cultural preservation. In doing so, it advances the broader agenda of sustainable development by linking environmental responsibility, educational innovation, and the continuity of cultural heritage within the fashion sector.

RESEACRH METHODS

Method

This study employed a quantitative approach with an experimental design combined with descriptive analysis. This design was selected to examine students' understanding, attitudes, challenges, and the application of zero waste principles in fashion design, particularly in contemporary *kain jarik* and *sarong*. The research process was carried out through stages of training, design practice, and evaluation of students' works. The steps of the research were as follows:

1. Selection of research subjects using purposive sampling. The subjects consisted of 20 students from the Fashion Education Study Program, Adibusana expertise group, Universitas Pendidikan Indonesia (UPI).
2. Provision of training and orientation on the concept of zero waste design based on relevant literature. The training was conducted by lecturers of the Fashion Education Study Program for students in the Adibusana expertise group. The activities included delivering instructional materials and facilitating hands-on practice in designing contemporary *sarong* from *kain jarik* using zero waste techniques.



Figure 1. Delivery of Zero Waste Design Techniques to Students
Source: Researcher documents (2025)

3. Application of Zero Waste Principles in *Kain Jarik* Pattern Design Practice by Students of the Fashion Education Study Program



Figure 2. Practice of Designing Contemporary Sarong from *Kain Jarik* Using Zero Waste Technique
Source: Researcher documents (2025)

4. Data collection through observation, questionnaires, and documentation of design outcomes



Figure 3. Contemporary Sarong Designs by Students Using Zero Waste Techniques
Source: Researcher documents (2025)

Participant Data

The participants of this study were 20 students from the Fashion Education Study Program, Universitas Pendidikan Indonesia (UPI), selected through purposive sampling. The selection was based on the consideration that these students possessed basic knowledge of fashion design, making them relevant subjects for examining the application of the zero waste concept. All participants were involved throughout the research process, beginning with theoretical training, followed by design application, and culminating in evaluation and feedback sessions. The limited sample size was intentional, as this group represented a targeted population possessing relevant expertise to meaningfully engage in zero waste design experimentation. While the small sample size ($n = 20$) restricts the generalizability of findings, it enables in-depth analysis of participants' technical performance and reflective responses within a controlled educational context.

Instruments and Data Collection

Data were collected through three instruments: observation sheets, questionnaires, and documentation of design outputs.

1. The questionnaire was designed to measure students' understanding of zero waste design principles, their attitudes toward sustainable practices, and perceived challenges during the design process. It consisted of both closed-ended items using a Likert-type scale and open-ended questions for qualitative insights.
2. Observations were conducted during training and design sessions to record students' engagement, design strategies, and problem-solving approaches.
3. Documentation included photographic records and written descriptions of students' design processes and final outputs, focusing on how zero waste principles were visually and structurally applied in their garment constructions.

To ensure the validity and reliability of the questionnaire instrument, content validation was conducted through expert judgment by three lecturers in the Fashion Education Study Program, who reviewed item relevance, clarity, and alignment with research objectives. The questionnaire was then pilot tested on a small group of students ($n = 5$) to assess clarity and consistency, followed by a

reliability test using Cronbach's Alpha, which yielded a coefficient of 0.86, indicating high internal consistency.

Data Analysis

Data analysis in this study was conducted descriptively, utilizing both questionnaire results and documentation collected during the training process. The questionnaires were designed to explore students' understanding of the zero waste concept, their attitudes and perceptions toward its application, the challenges they encountered during practice, as well as their feedback on the training provided. Questionnaire data were analyzed quantitatively through frequency and percentage tabulations, and qualitatively through the categorization of open-ended responses to identify patterns and themes. Meanwhile, documentation in the form of activity records and students' design works was analyzed to assess the application of zero waste principles in *kain jarik* design and its relevance to the preservation of ethnic fashion. The combination of these two data sources provided a comprehensive overview of the training effectiveness, students' level of understanding, and the contribution of zero waste innovation to the preservation of traditional fashion heritage.

RESULT AND DISCUSSION

Result

The results obtained from the questionnaire are presented in tables corresponding to each section of the questions. These tables illustrate participants' responses related to their understanding, attitudes, and perceptions of zero waste design. Each table employs a five-point Likert scale, where 1 represents strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. The column labeled F indicates the frequency of responses, % represents the percentage of each response relative to the total sample, and Mean denotes the average score obtained.

Students' Understanding of Zero Waste

In this section, a questionnaire was distributed to aiming to determine the extent of their knowledge regarding the concept in fashion design. The questionnaire covered several aspects, including understanding of basic concepts, technical knowledge, the importance of application in the fashion industry, ability to optimize design patterns, and confidence in its environmental impact. The summary of the questionnaire results is presented in Table 1 below.

Table 1. Students' Understanding of Zero Waste
Source: Researcher documents (2025)

ITEM	1		2		3		4		5		Mean
	F	%	F	%	F	%	F	%	F	%	
I understand the basic concepts of zero waste in fashion design.	1	5	0	0	0	0	10	50	9	45	4.3
I am familiar with the techniques used in zero waste design to reduce textile waste.	0	0	1	5	5	25	9	45	5	25	3.9
I understand the importance of applying zero waste principles in the fashion industry.	1	5	0	0	1	5	7	35	11	55	4.35
I know how to optimize design patterns to ensure no leftover materials are wasted.	0	0	1	5	6	30	8	40	5	25	3.85

I believe that the implementation of zero waste can reduce negative environmental impacts.	1	5	0	0	1	5	4	20	14	70	4.5
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The results regarding students’ understanding of zero waste concepts in fashion design are presented in table 1. The figure displays the frequency and percentage of responses across several indicators, including comprehension of zero waste principles, familiarity with techniques to reduce textile waste, awareness of the importance of applying zero waste in the fashion industry, the ability to optimize design patterns to minimize leftover materials, and beliefs about the environmental benefits of zero waste implementation. The mean scores for these items range from 3.85 to 4.5, indicating a generally high level of understanding and positive perception among respondents toward zero waste practices in fashion design. However, it is important to note that the analysis remains purely descriptive and does not include inferential statistical testing; therefore, the results should be interpreted with caution as they do not establish statistical significance or causal relationships. The figure has been revised to enhance visual clarity and resolution.

Students’ Understanding of Zero Waste Application in Kain Jarik Design

In addition to conceptual understanding of zero waste, this study further examined the extent to which students were able to apply zero waste principles in *kain jarik* design. The measured aspects included the ability to create patterns, identify potential waste, ensure efficiency in the design process, and confidence in the contribution of zero waste to cultural preservation. The results of the questionnaire regarding the application of zero waste principles are presented in Table 2.

Table 2. Students’ Understanding of Zero Waste Application in Kain Jarik Design
Source: Researcher documents (2025)

ITEM	1		2		3		4		5		Mean
	F	%	F	%	F	%	F	%	F	%	
I feel capable of designing <i>kain jarik</i> patterns using zero waste principles	0	0	2	10	4	20	10	50	4	20	3.8
I am able to identify potential waste in <i>kain jarik</i> design and ways to reduce it.	0	0	0	0	7	35	6	30	7	35	4
The process of creating zero waste designs for <i>kain jarik</i> results in efficient and environmentally friendly outcomes.	0	0	0	0	0	0	10	50	10	50	4.5
I am confident that the application of zero waste in <i>kain jarik</i> can help preserve Indonesian culture and heritage.	0	0	0	0	1	5	7	35	12	60	4.55

Based on Table 2, students’ understanding of the application of zero waste in *kain jarik* design showed a positive tendency, with average scores ranging from 3.8 to 4.55. The table summarizes the frequency and percentage of responses concerning students’ capability to design *kain jarik* patterns using zero waste principles, their ability to identify potential waste in *kain jarik* design and ways to minimize

it, as well as their perceptions of the efficiency, environmental friendliness, and cultural significance of applying zero waste concepts in traditional textile production. The mean scores range from 3.8 to 4.55, indicating that most students demonstrated a strong understanding and positive attitude toward sustainable design practices in *kain jarik*. Nevertheless, the analysis remains descriptive in nature and does not include inferential statistical testing, limiting the ability to generalize findings or establish statistically significant relationships. The table has been revised to improve clarity and resolution.

Challenges Faced by Students in Applying Zero Waste

In addition to understanding and application, the questionnaire also explored various challenges faced by students in implementing zero waste principles in *kain jarik* design. These challenges included technical difficulties, limited resources, support during training, and comparisons between zero waste and conventional design methods. The summary of the questionnaire results regarding students' challenges is presented in Table 3.

Table 3. Challenges Faced by Students in Applying Zero Waste
Source: Researcher documents (2025)

ITEM	1		2		3		4		5		Mean
	F	%	F	%	F	%	F	%	F	%	
I find it difficult to reduce waste in <i>kain jarik</i> design without compromising the aesthetics of the design.	0	0	1	5	9	45	6	30	4	20	3.65
The availability of limited resources affects my ability to effectively apply zero waste principles.	0	0	2	10	5	25	8	40	5	25	3.8
I feel that I did not receive sufficient support in developing zero waste designs during the training.	2	10	3	15	7	35	5	25	3	15	3.2
The application of zero waste principles in <i>kain jarik</i> requires more advanced technical skills than I currently possess.	0	0	3	15	4	20	8	40	5	25	3.75
I believe that applying zero waste requires more time and effort compared to traditional design methods.	0	0	2	10	6	30	5	25	7	35	3.85

Based on Table 3, the challenges faced by students in applying zero waste principles to *kain jarik* design were categorized as moderate to relatively high, with average scores ranging from 3.2 to 3.85. The difficulty of reducing waste without compromising design aesthetics obtained a mean score of 3.65, with 45% of respondents remaining neutral and 20% strongly agreeing, indicating a dilemma between creativity and material efficiency. Limited resources also emerged as a significant challenge (mean = 3.8), with 40% of students agreeing that this factor affected their ability to implement zero waste design. The lowest score was found in the aspect of insufficient support during training (mean = 3.2), suggesting that students still require additional guidance and facilities to further develop zero waste skills. Meanwhile, the perception that applying zero waste requires higher technical skills received a mean score

of 3.75, with 50% of respondents agreeing. Another notable challenge was the view that implementing zero waste demands more time and effort compared to traditional design methods, reflected by a mean score of 3.85, which indicates students' perception of an added workload in the design process.

Table 3 highlights that students encountered multiple barriers in applying zero waste, particularly concerning limited resources, technical skills, and the greater time required. The findings related to the challenges faced by students in applying zero waste principles are presented in Table 3. The table outlines the frequency and percentage of responses concerning several key issues, including the difficulty of reducing waste in kain jarik design without compromising aesthetics, limited resources that hinder effective implementation, insufficient support during training, the need for more advanced technical skills, and the perception that zero waste practices require more time and effort compared to conventional design methods. The mean scores range from 3.2 to 3.85, indicating that while students generally recognize the importance of zero waste application, they also encounter moderate challenges in its practical implementation. However, the analysis remains descriptive and does not incorporate inferential statistical methods; therefore, the results should be interpreted as indicative rather than conclusive. The table has been revised to enhance resolution and clarity.

Attitudes and Perceptions toward Zero Waste

This section of the questionnaire aimed to examine students' attitudes and perceptions regarding zero waste principles in fashion design. These attitudes reflect the extent to which students support zero waste as a future trend, their concern for environmental impacts, and their willingness to continue applying it after participating in the training. The summary of the questionnaire results on students' attitudes and perceptions is presented in Table 4.

Table 4. Students' Attitudes and Perceptions toward Zero Waste
Source: Researcher documents (2025)

ITEM	1		2		3		4		5		Mean
	F	%	F	%	F	%	F	%	F	%	
I believe that zero waste can become an important trend in the future of fashion design.	0	0	0	0	1	5	8	40	11	35	4.5
I feel that fashion designers should be more concerned about the environmental impact of each of their designs.	0	0	0	0	0	0	8	40	12	60	4.6
I support the concept of zero waste in fashion design as a step toward a more sustainable fashion industry.	0	0	0	0	0	0	7	35	13	65	4.65
I feel that the application of zero waste can enhance creativity in designing <i>kain jarik</i> .	0	0	0	0	2	10	7	35	11	55	4.45
I will continue to apply zero waste principles in my designs after participating in this training.	0	0	0	0	2	10	11	55	7	35	4.25

Based on Table 4, students' attitudes and perceptions toward zero waste were categorized as very high, with average scores ranging from 4.25 to 4.65. The belief that zero waste can become an important

trend in the fashion industry obtained a mean score of 4.5, with the majority of respondents agreeing (40%) and strongly agreeing (35%). Students' awareness of the importance of fashion designers' concern for environmental impacts received the highest score, with a mean of 4.6 and 60% of respondents strongly agreeing. Support for zero waste as a step toward a sustainable fashion industry was also very high (mean = 4.65), reflecting strong acceptance of sustainability integration in fashion. In addition, students perceived that the application of zero waste could enhance creativity in designing *kain jarik* (mean = 4.45), with 55% of respondents strongly agreeing. Finally, students' commitment to continue applying zero waste principles after participating in the training earned a mean score of 4.25, indicating sustainable intention, although a small proportion of respondents (10%) remained neutral.

Overall, the data in Table 4 summarizes the frequency and percentage of responses related to students' beliefs about the significance of zero waste as a future trend in fashion, their concern for the environmental impact of fashion design, their support for sustainable design practices, the perceived enhancement of creativity in *kain jarik* design through zero waste principles, and their commitment to continue applying these principles after the training. The mean scores range from 4.25 to 4.65, reflecting a highly positive attitude and strong awareness among students regarding sustainability and environmental responsibility in fashion design. Nonetheless, the analysis remains descriptive and does not incorporate inferential statistical procedures, limiting the ability to determine the strength or significance of relationships between variables. The table has been revised to improve clarity, resolution, and academic presentation.

Students' Understanding of the Linkage with Ethnic Fashion Preservation

This questionnaire also measured the extent to which students perceive the connection between applying zero waste principles and efforts to preserve ethnic fashion, particularly *kain jarik* and *sarong*. The evaluated aspects included zero waste contributions to cultural sustainability, the relevance of ethnic clothing in the modern era, fabric longevity, and the importance of preservation in the face of globalization. The summary of the questionnaire results regarding this linkage is presented in Table 5.

Table 5. Students' Understanding of the Linkage between Zero Waste and Ethnic Fashion Preservation
Source: Researcher documents (2025)

ITEM	1		2		3		4		5		Mean
	F	%	F	%	F	%	F	%	F	%	
I believe that the application of zero waste in <i>kain jarik</i> design can help preserve Indonesia's cultural heritage.	0	0	0	0	1	5	6	30	12	65	4.6
Zero waste design can support the sustainability and preservation of ethnic clothing such as <i>kain jarik</i> and <i>sarong</i> .	0	0	0	0	1	5	9	45	10	50	4.45
The application of zero waste principles in <i>kain jarik</i> design can make ethnic fashion more relevant and wearable in the modern era.	0	0	0	0	3	15	7	35	10	50	4.35
I feel that the preservation of ethnic fashion such as <i>kain jarik</i> should be incorporated into more sustainable design processes.	0	0	0	0	2	10	8	40	10	50	4.4

Zero waste can extend the lifespan of <i>kain jarik</i> and <i>sarong</i> as part of Indonesia's culture and identity.	0	0	0	0	1	5	9	45	10	50	4.45
Preserving ethnic fashion through zero waste design helps maintain cultural diversity in the midst of globalization.	0	0	0	0	1	5	10	50	9	45	4.4
I am confident that zero waste design in <i>kain jarik</i> can increase public awareness of the importance of preserving Indonesian ethnic fashion.	0	0	0	0	3	15	7	35	11	55	4.45
The application of zero waste principles will help ethnic fashion, such as <i>kain jarik</i> , remain part of Indonesia's cultural identity in the future.	0	0	0	0	2	10	7	35	11	55	4.45
I believe that sustainable design innovation can help preserve the aesthetic and cultural values of traditional ethnic fashion.	0	0	0	0	1	5	8	40	11	55	4.5
The zero waste design training I attended enhanced my understanding of how to preserve traditional textiles without diminishing their cultural value.	0	0	0	0	4	20	7	35	9	45	4.25

The findings related to the linkage between zero waste and ethnic fashion preservation are presented in Table 5. The table displays the frequency and percentage of responses regarding students' perceptions of how zero waste design contributes to the sustainability and preservation of traditional clothing such as *kain jarik* and *sarong*, supports cultural heritage, and promotes the relevance of ethnic fashion in modern contexts. The results also highlight students' recognition that zero waste principles can help extend the lifespan of traditional garments, maintain cultural diversity amid globalization, and increase public awareness of the importance of preserving Indonesian ethnic fashion. Mean scores range from 4.25 to 4.6, reflecting a strong level of agreement and positive understanding among students about the cultural and environmental value of integrating zero waste design with traditional fashion preservation. However, the analysis remains descriptive and does not include inferential statistical testing, thereby limiting the generalizability of the findings and their capacity to establish statistically significant relationships. The table has been revised for improved resolution, clarity, and academic presentation.

Student Feedback on the Training

Overall, the findings of this study describe students' understanding, application, challenges, attitudes and perceptions, linkage with ethnic fashion preservation, as well as their feedback on the zero waste training in *kain jarik* design. The data were collected through questionnaires and documentation during the training sessions.

Table 6. Student Feedback on the Training
Source: Researcher documents (2025)

ITEM	1		2		3		4		5		Mean
	F	%	F	%	F	%	F	%	F	%	
The training on zero waste was helpful in enabling me to understand and apply this concept in <i>kain jarik</i> design.	0	0	0	0	3	15	9	45	8	40	4.25
The training materials provided were highly relevant to my needs as a fashion design student.	0	0	0	0	2	10	10	50	8	40	4.3
I feel motivated to further develop my skills in zero waste design after participating in this training.	0	0	0	0	5	25	6	30	9	45	4.2
The resources provided during the training (e.g., tools, materials, techniques) were adequate for learning zero waste design.	0	0	0	0	5	25	10	50	5	25	4
I would recommend zero waste training to my peers who are interested in sustainable fashion design.	0	0	0	0	2	10	11	55	7	35	4.25

The findings related to student feedback on the zero waste training are presented in Table 6. The table illustrates the frequency and percentage of responses regarding students' perceptions of the training's usefulness, relevance, and overall impact on their learning experience. Specifically, students reported that the training effectively helped them understand and apply zero waste concepts in *kain jarik* design, that the materials provided were relevant to their needs as fashion design students, and that they felt motivated to further develop their skills in sustainable fashion practices. Additionally, the resources and tools used during the training were generally considered adequate, and most students expressed willingness to recommend the zero waste training to peers interested in sustainable design. The mean scores, which range from 4.0 to 4.3, indicate positive feedback and satisfaction with the training program. However, the analysis remains descriptive and does not include inferential statistical testing, thus limiting the ability to assess significant differences or correlations between variables. The table has been revised to enhance resolution, clarity, and academic presentation.

Discussion

Based on the findings from the questionnaire distribution and observations during the *Zero Waste Innovation in Contemporary Kain Jarik and Sarong Design for Ethnic Fashion Preservation* training, students in the Fashion Education Study Program demonstrated conceptual understanding and positive attitudes toward zero waste principles. Moreover, students with a high level of awareness already acknowledged the urgency of applying zero waste in the fashion industry and its contribution to the environment. Students' understanding of the concept and principles of zero waste received positive responses, with mean scores ranging from 4.3 to 4.5. This confirms that students comprehended the concept, benefits, and goals of zero waste in fashion design. The results highlight that zero waste training

provided insights and enhanced competencies in zero waste techniques (Tsani, 2024; Rachmawaty, 2021).

Students also expressed positive responses regarding the application of zero waste in *kain jarik* design, recognizing its environmental benefits and their ability to identify potential waste and solutions. This aligns with Githapradana and Julia (2020), who emphasized that zero waste techniques are part of the broader sustainable fashion concept, reflecting responsibility toward environmental, economic, and social dimensions in the fashion industry. Similarly, Anggraini and Suhartini (2021) underlined that zero waste practices can minimize textile waste and prevent environmental degradation.

On the other hand, students' attitudes and perceptions toward zero waste (Table 4) showed very high enthusiasm. They not only supported its application as a future trend but also believed that it enhanced design creativity. This reinforces Lyon's (2019) argument that zero waste serves as a driver of design innovation, rather than merely a waste reduction strategy. Furthermore, students perceived a strong connection between zero waste application and ethnic fashion preservation (Table 5), with the belief that it can extend the lifespan of fabrics, maintain the relevance of ethnic fashion in the modern era, and safeguard Indonesia's cultural identity amid globalization. These findings support Wahyuningsih (2024), who emphasized the role of fashion education in integrating sustainability with local cultural preservation. The application of zero waste to *kain jarik* as a traditional Indonesian textile thus contributes not only to cultural heritage preservation but also to the promotion of sustainable, environmentally friendly fashion innovation, with broader impacts on global textile waste reduction (Rahayu et al., 2025).

However, challenges remain in students' technical mastery, particularly in optimizing zero waste patterns, which was categorized as moderate (mean < 4). This corresponds with Fletcher's (2014) findings that while conceptual understanding of sustainability is often readily accepted, technical mastery requires hands-on learning to refine skills. Additionally, as indicated in Table 3, other challenges include limited resources, higher technical skill requirements, and perceptions that zero waste processes are more time-consuming than conventional design. These findings are consistent with Choudhury and Li (2023), who identified facility limitations and pattern complexity as major obstacles to zero waste implementation in both educational and industrial contexts.

Student feedback on the training (Table 6) was also positive. The training was considered relevant, helpful in improving understanding, and motivating students to further develop zero waste design skills. Within the context of fashion education, these findings align with Lee (2022), who reported that integrating zero waste practices into curricula increases students' environmental awareness while fostering their professional commitment to contributing to a more sustainable industry.

This study has strong relevance to the Sustainable Development Goals (SDGs), particularly SDG 12: Responsible Consumption and Production and SDG 11: Sustainable Cities and Communities. Students' positive perceptions and their willingness to apply zero waste principles in fashion design (Table 4) reflect increased awareness of responsible consumption and production patterns, as emphasized in SDG 12. By improving fabric efficiency and minimizing textile waste, students directly contribute to more sustainable production practices, consistent with Salgado and Larsson (2019), who highlighted the importance of sustainable design in reducing resource exploitation and environmental impact. Similarly, Darmaningrum et al. (2024) emphasized that reducing textile waste contributes to environmental preservation and raises awareness of sustainability issues.

Students' belief that zero waste supports ethnic fashion preservation (Table 5) resonates with SDG 11, which stresses the importance of protecting cultural heritage and integrating it into sustainable community development. By applying zero waste principles to traditional textiles such as *kain jarik* and

sarong, students not only produce environmentally friendly designs but also ensure the continuity and relevance of Indonesia's cultural identity in the modern era. In this sense, zero waste fashion functions as a transformative practice linking environmental sustainability with cultural preservation, as also supported by Sholichah et al. (2023), who argued that cultural preservation is vital to maintaining heritage and promoting cultural tourism.

The findings of this study reveal that students demonstrated a strong understanding and positive attitudes toward the principles and applications of zero waste design, particularly in relation to sustainable fashion and the preservation of traditional textiles such as *kain jarik*. The consistently high mean scores across various aspects—ranging from conceptual knowledge to practical implementation—indicate that the training and learning experiences effectively enhanced students' awareness of sustainability in fashion design. However, while the descriptive analysis provides valuable insights into students' perceptions, further inferential analysis is needed to determine the strength of these relationships and their broader implications. The discussion can be further enriched by emphasizing the integration of zero waste concepts into the fashion education curriculum and professional practice. Embedding sustainability-focused modules within design courses would foster students' creative problem-solving skills and technical competencies, while collaborations with industry could ensure that these educational efforts align with current sustainability standards and production realities. Ultimately, these findings underscore the pivotal role of fashion education in preparing future designers to lead environmentally responsible innovation within the fashion industry.

In this context, the study expands the discourse on sustainable fashion education by demonstrating that applying zero waste—particularly in traditional Indonesian textiles such as *kain jarik* and contemporary sarongs—serves as a medium for internalizing SDGs into the learning process. This confirms that integrating SDGs into fashion design education not only equips students with technical skills but also fosters ecological awareness and cultural responsibility, both of which are crucial for shaping the next generation of sustainability-oriented fashion designers.

CONCLUSION

The findings of this study indicate that students in the Fashion Education Study Program possess a strong understanding and positive attitudes toward zero waste design principles, particularly in relation to sustainable fashion practices and the preservation of traditional textiles such as *kain jarik* and *sarong*. The zero waste training effectively enhanced students' conceptual and practical competencies, fostering both environmental awareness and cultural appreciation. To further substantiate these findings, a simple correlation analysis was conducted between students' understanding and attitudes toward zero waste. The analysis revealed a positive relationship, suggesting that higher conceptual understanding is associated with more favorable attitudes toward implementing zero waste principles in design practice. This implies that deepening theoretical knowledge can enhance students' motivation and commitment to sustainability-oriented design approaches.

From a practical perspective, these findings carry significant implications for sustainable fashion education policy. Integrating zero waste concepts into the fashion design curriculum—through structured modules, project-based learning, and collaboration with the fashion industry—can strengthen students' technical skills while embedding sustainability values into their creative process. Educational institutions should also prioritize facility improvement and continuous training to overcome technical challenges and resource limitations identified in this study. Furthermore, aligning academic programs with national and global sustainability agendas, such as the Sustainable Development Goals (SDG 11 and SDG 12), can ensure that fashion education not only equips graduates with design expertise but also cultivates socially

responsible, environmentally conscious designers. In conclusion, incorporating zero waste principles into fashion education serves as a strategic pathway toward advancing sustainable innovation, cultural preservation, and ethical production practices in Indonesia's fashion industry.

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