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Integration of Combination Embroidery Technique in Fashion Design Learning in Vocational Education

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Abstract
This study addresses the lack of knowledge among fashion producers about creative and trendy hand embroidery designs, and the shift in women's workwear in Indonesia from formal to smart casual styles, especially since the COVID-19 pandemic. Smart casual clothing is characterized by flexibility, comfort, and trend-consciousness, blending professionalism with a relaxed appearance. This research aimed to: (1) explore the application of creative and trendy combination embroidery in smart casual fashion design, and (2) analyze consumer responses to these embroidery concepts. Using a descriptive-exploratory method with a survey approach, the study involved 5 expert panelists and 128 prospective consumers from various backgrounds. Four smart casual fashion products with combination embroidery were created and assessed using rating sheets and questionnaires. The results showed that combination embroidery, applied to specific clothing details with symmetrical and asymmetrical concepts, enhanced the visual appeal of smart casual fashion. Consumer responses were highly positive, with 93.75% favoring asymmetrical designs and 82.03% favoring symmetrical ones. These findings suggest that innovative embroidery applications can increase the attractiveness and marketability of smart casual clothing, offering practical design alternatives for the fashion industry.

Keywords
combination embroidery; consumer perception; fashion design; smart casual clothing; vocational fashion education

INTRODUCTION

The fashion industry is one of the creative economy sectors that is growing rapidly and contributes significantly to the Indonesian economy (Mahanani & Jerusalem, 2025). Since 2020, this sector has contributed around 18.15% to the Gross Domestic Product (GDP) of the national creative economy (Muis et al., 2020). In the fashion industry, fashion

decoration techniques have become one of the main innovations that continue to grow, along with the increase in the number of fashion designers.

Demand for unique and aesthetic fashion designs. This development encourages designers to explore various combination embroidery techniques that not only add aesthetic value but also create a distinct identity for each fashion piece (Liao, 2019), (Nurfadila, 2024). This diversity of techniques allows designers to create collections that not only meet market tastes but also encourage innovation and creativity in the fashion industry as a whole (Chen, 2025). Innovations in embellishment techniques also contribute to sustainability, with many designers starting to use eco-friendly materials and ethical production practices to appeal to consumers who are increasingly aware of environmental impacts (Jocić, 2022).

Embroidery is an ornamental technique that has long been used in the fashion world because it can give an exclusive and artistic touch to clothing (De La Cruz-Fernández, 2014), (Sunarti et al., 2023). Combination embroidery is a technique that combines various embroidery methods, such as thread embroidery, beads, ribbons, and other textile elements, to create more complex and interesting designs (Su et al., 2018). This technique is widely applied to women's clothing, such as work clothes, parties, to accessories such as bags and hijabs. However, although this technique has great potential in increasing the aesthetic value and selling value of clothing, there are still many fashion industry players who do not fully understand or utilize combination embroidery techniques in their designs (Sumardani, Pipin Tresna P., 2021). In addition, current fashion trends show a shift in preference from formal workwear towards smart casual, which is clothing that is still polite and professional but more flexible and comfortable for everyday use (Mecnika et al., 2015).

With this trend change, it is important to explore the combination embroidery technique as a decorative element in smart casual clothing. This exploration not only aims to increase the attractiveness of the clothing but also to provide references for the fashion industry in creating more innovative products (Yang, 2022). This research was conducted to explore more deeply the application of combination embroidery in smart casual clothing, as well as to analyze potential users' responses to the resulting designs. Hand embroidery is an ornamental technique that has been used for a long time in the fashion world. This technique is done manually with a needle and thread, producing unique decorative patterns.

Various types of hand embroidery have developed in various cultures, such as blackwork embroidery from Europe, kantha from India, and sashiko from Japan (F. Sari & Handayani, 2023), (Gadi et al., 2021). In its development, embroidery not only uses threads but it also uses additional materials such as sequins, ribbons, and beads to enhance the aesthetics of the design.

Combination embroidery is an innovation in embroidery techniques, where different materials and embroidery techniques are combined to create a richer and more artistic look. This technique has been used in various fashion products, including party wear and work wear. Some previous studies have shown that combination embroidery can increase the aesthetic value and marketability of fashion products (Wang, 2022), (Ruiting, 2023). For example, research by Sumardani (Sumardani, Pipin Tresna P., 2021) shows that the combination of beading embroidery technique with cabochon technique produces a luxurious visual effect and is in demand by consumers. Another study by (Vera et al., 2021) highlighted the use of sequin embroidery in batik party wear, which received very favorable responses from expert panelists.

In addition to the aspect of embroidery techniques, this research also refers to the increasingly popular smart casual fashion trend. Smart casual style is defined as a blend of formal and casual styles, giving a professional yet comfortable impression. Some fashion items that fall into this category are casual shirts, blazers, cardigans, and sweaters with more flexible cuts than conventional work clothes. This trend began to develop especially after the COVID-19 pandemic, when many workers began to look for alternatives to work clothes that were more relaxed but still polite (L. Sari, 2021). By considering the results of previous studies as well as current fashion trends, this research seeks to explore and analyze the application of combination embroidery as a decorative element on smart casual clothing. In addition, this research also measures the level of potential users' interest in the resulting designs, both from an aesthetic and functionality perspective.

Based on the aforementioned background, this study aims to explore the application of combination embroidery techniques as decorative elements in smart casual clothing and to analyze potential users' responses to the resulting designs in terms of aesthetics and functionality. The findings of this research are expected to contribute not only to innovation in fashion design within the industry but also to serve as a valuable reference in the field of education, particularly vocational education in fashion design. The

implementation of combination embroidery techniques can be integrated into contextual and industry-relevant learning materials, thereby enhancing students' creative skills in designing garments that are both aesthetic and functional. Consequently, this research has implications for improving curriculum relevance and the quality of vocational education graduates, better preparing them to meet the challenges and opportunities of the creative industry.

METHOD

This research is a type of exploratory descriptive research with quantitative and qualitative approaches (Amruddin et al., 2022). Descriptive research aims to describe the nature of something ongoing when research is conducted and examine the causes of certain symptoms. Exploratory descriptive research aims to describe the state of a phenomenon. In this study, it is not intended to test a particular hypothesis, but only to describes what a variable, symptom, or situation is (Sugiyono, 2022).

The subjects of this research were expert panelists from academia and industry in the field of fashion decoration. Academic panelists consisted of: Fashion decoration lecturers, design lecturers, and entrepreneurship lecturers. Expert panelists from the industry consisted of: Combination embroidery practitioners (MSMEs related to embroidery), marketing practitioners (MSMEs related to fashion) (Histon & Scott, 2009). The reason for selecting expert panelists from academia and industry is to be able to provide assessment and input in the form of suggestions that can be used as teaching material for development and suitability with current industry conditions. Data collection in this study was carried out through several methods to ensure the validity and reliability of the results obtained. These methods include: 1) Experimentation; 2) Panelist test; 3) Questionnaire; and 4) documentation.

Experiments were conducted to prepare valid and reliable test samples, especially in testing internal and external validity. The samples used were a combination of embroidery products applied to smart casual clothing. Furthermore, the panelist test was used to assess the feasibility of embroidery technology, design of decorative motifs, application of elements and principles of decoration, embroidery finishing techniques, and quality of embroidery materials on combination embroidery products. This assessment was conducted using a test sheet and rubric with a Likert scale as follows: score 4 for very good

category (very high feasibility), score 3 for good (high feasibility), score 2 for good enough (low feasibility), and score 1 for not good (low feasibility).

In addition, the questionnaire method was used to collect responses from fashion experts and potential customers on the application of combination embroidery on smart casual clothing. Respondents in this study consisted of potential female consumers with an age range of 18-50 years from lecturers, employees, and students at Universitas Negeri Yogyakarta (UNY), as well as alumni of the Fashion Design department, with a total of 128 people. The research location was at UNY Wates Campus, Yogyakarta. Finally, documentation was used to record the entire experimental process from stage to stage, as well as the data collection process, to ensure the accuracy of the research results. Each variable in this study uses a Likert scale with four answer options scored from 1 to 4, from worst to best.

RESULT AND DISCUSSION

This research discusses design exploration and combination embroidery techniques applied as decoration on smart casual clothing with two design concepts, namely symmetrical and asymmetrical. Some indicators that must be considered are: 1) Attractive display results; 2) Ease of production; 3) Size suitability; 4) Type or style of clothing; 5) Dimension of fabric material; 6) Fashion silhouette; 7) Flexibility of fashion design and pattern; 8) Construction of decoration motif design. An exploration of smart casual fashion design with a combination of embroidery techniques can be seen in Figure 1.

Figure 1. Exploration of Combination Embroidery Design on Smart Casual Clothing.

Next, a sample was made by applying two concepts, asymmetrical and symmetrical. Design exploration and combination embroidery techniques applied as decoration were

analyzed based on design elements and principles. To evaluate its application in fashion embellishment, two prototypes were made, each with its design elements and principles.

Each with asymmetrical and symmetrical concepts. The evaluation was conducted by five fashion expert panelists who assessed the test samples through a video demonstration by a model. In addition, this research also presents data and analysis on potential customers' opinions on the design and embroidery technique combination applied as decoration on smart casual clothing with both concepts.

Application of the Symmetrical Concept

Analysis of the elements and principles of decorative design includes line, direction, texture, shape, color, balance, and rhythm. The results of the analysis of the application of embroidery in combination with the symmetrical concept of design 1 are as follows:

1. Lines and directions

   Using symmetrical (diagonal) lines and directions. Symmetrical balance is the balance between the left side of the room and the right side of the room, the same, both in shape, size, direction, color, and texture.

2. Texture and shape

   Using three-dimensional (3D) textures and shapes of flora. The embroidery material used produces a three-dimensional (3D) texture that can be seen from any point of view.

3. Color

   Using opposite combinations (double complement). The opposite combination of colors used is maroon, jade, rose gold, and marine blue.

4. Balance

   Using symmetrical balance, which is the balance between the left and right side of the room, is the same, both in its shape, size, direction, color, and texture.

5. Rhythm

   Uses regular, repetitive, graduated rhythms.

The application of the combination embroidery of the symmetrical concept of design 1 is shown in figure 2.

Figure 2. Application of Combination Embroidery on Smart Casual Clothing Symmetrical Concept Design 1
(video documentation: https://youtu.be/253nkSPIq5Q)

The application of the combination embroidery of the symmetrical concept of design 2 is shown in figure 3.

Figure 3. Application of Combination Embroidery on Smart Casual Clothing Symmetrical Concept Design 2
(video documentation: https://youtu.be/MtpKQUHEYyM)

Designs 1 and 2 are an application of the symmetrical concept, namely the application of motifs located on the left and right neckline. These design elements and principles are applied to the product construction design, as well as the motif design.

Application of the Asymmetrical Concept

Analysis of the elements and principles of decorative design includes line, direction, texture, shape, color, balance, and rhythm. The results of the analysis of the application of embroidery in combination with the asymmetrical concept of design 1 are as follows:

1. Lines and directions

   Using asymmetrical (diagonal) lines and directions. A balance in which the arrangement of elements on each side is placed differently but still gives the

impression of balance, either with vertical, diagonal, horizontal, or combination composition. Another impression is that of movement, freedom, and spontaneity.

2. Texture and shape

   Using three-dimensional (3D) textures and shapes of flora. The embroidery material used produces a three-dimensional (3D) texture that can be seen from any point of view.

3. Color

   Using opposite combinations (double complement). The opposite combination of colors used is maroon, forest green, rose brown, rosegold, and powder blue.

4. Balance

   Using Asymmetric obvious. Equal balance (obvious balance) is a compositional balance between the left side space and the right side space, regardless of the shape in each space. Although they have different shapes, they are equal in size.

5. Rhythm

   Uses a regular, repetitive, dynamic rhythm.

The application of the combination embroidery of the asymmetrical concept of design 3 is shown in figure 4.

Figure 4. Application of Combination Embroidery on Smart Casual Clothing Asymmetrical Concept Design 3
(video documentation: https://youtu.be/wZykQnXsjuA)

The application of the combination embroidery of the asymmetrical concept of design 4 is shown in figure 5.

Figure 5. Application of Combination Embroidery on Smart Casual Clothing Asymmetrical Concept Design 4
(video documentation: https://youtu.be/x9vDcuRBKlw)

Designs 3 and 4 are an application of the symmetrical concept, namely the application of motifs located on the left and right neckline. These design elements and principles are applied to the product construction design, as well as the motif design.

Expert Panelist Test on Product Feasibility

The evaluation was conducted by five fashion expert panelists who assessed the test sample through a video demonstration by a model. Based on the results of the sample test with 5 fashion expert panelists, the following data were generated:

The expert panelists' assessment of the application of combination embroidery on smart casual clothing with a symmetrical concept showed very good results. Five expert panelists gave a final score ranging from 10.9 to 12, with an average value per indicator as follows: beauty (7.6), color (10.4), size (6.8), attention (7.6), need (6.4), and object quality (32.6). Data on the total score of the expert panelists' assessment can be seen in Table 1.

Table 1. Data on the total score of the expert panelist assessment on the application of combination embroidery on Smart Casual clothing with the Symmetrical concept

Panelist No	Total Score	Aesthetic (10%)	Color (20%)	Size (20%)	Attention (20%)	Needs (15%)	Object Quality (15%)	Final Achievement Score
1	70	7	11	7	6	6	33	11.35
2	71	7	11	8	8	6	31	11.65
3	74	8	12	6	8	6	34	12
4	68	8	8	6	8	8	30	10.3
5	74	8	10	7	8	6	35	11.95
Total	357	38	52	34	38	32	163	57.85
Average		7.6	10.4	6.8	7.6	6.4	32.6	

Furthermore, based on the calculation of the score interval, the application of combination embroidery is categorized into four levels: "Very Good" (10.7-13), "Good" (8.2-10.6), "Not Good" (5.7-8.1), and "Not Good" (3.2-5.6). Of the five panelists, four (80%) rated it in the "Very Good" category, while one (20%) rated it in the "Good" category. There were no ratings in the "Poor" or "Not Good" categories.

Based on the calculation of the interval classes above, the frequency distribution of categorization of the application of combination embroidery applied as decoration on smart casual clothing with a symmetrical concept can be seen in Table 2.

Table 2. Data distribution of frequencies and percentages of panelists on the application of combination embroidery on smart casual clothing with a Symmetrical Concept

No	Categorization of application combination embroidery with symmetrical concept	Score Interval	Frequency distribution (N)	Percentace (%)
1	Very good	10.7 - 13	4	80%
2	Good	8.2 - 10.6	1	20%
3	Less good	5.7 - 8.1	0	0%
	Not good	3.2 - 5.6	0	0%
	Total		5	100%

The data table above shows that there is a tendency for fashion expert panelists to give a very good assessment on the categorization of the application of combination embroidery on smart casual clothing with a symmetrical concept. This is proven by the fact that all five (5) expert panelists (100%) gave excellent ratings.

The expert panelists' assessment of the application of combination embroidery on smart casual clothing with asymmetrical concepts showed very good results. Five expert panelists gave a final score ranging from 7.65 to 11.8, with an average value per indicator as follows: beauty (7), color (8.4), size (8), attention (7.6), necessity (6.7), and object quality (25.4). Data on the total score of the expert panelists' assessment can be seen in Table 3.

Table 3. Data on the total score of the expert panelist assessment on the application of combination embroidery on Smart Casual clothing with the Asymmetrical concept

Panelist No	Total Score	Aesthetic (10%)	Color (20%)	Size (20%)	Attention (20%)	Needs (15%)	Object Quality (15%)	Final Achievement Score
1	63	6	9	6	7	6	25	7.65
2	66	7	8	8	8	6	29	10.75
3	68	8	9	6	6	6	31	8.25
4	68	8	11	6	6	7	28	10.75
5	71	8	10	7	8	7	31	11.8
Total	340	37	47	35	38	35	148	55.45
Average		7	8.4	8	7.6	6.7	25.4	

Furthermore, based on the calculation of the score interval, the application of combination embroidery is categorized into four levels: "Very Good" (10.7-13), "Good" (8.2-10.6), "Not Good" (5.7-8.1), and "Not Good" (3.2-5.6). Of the five panelists, four (80%) rated it in the "Very Good" category, while one (20%) rated it in the "Good" category. There were no ratings in the "Poor" or "Not Good" categories.

Based on the calculation of the interval classes above, the frequency distribution of categorization of the application of combination embroidery applied as decoration on smart casual clothing with an asymmetrical concept can be seen in the following table 4.

Table 4. Data distribution of frequencies and percentages of panelists on the application of combination embroidery on smart casual clothing with a Asymmetrical Concept

No	Categorization of application combination embroidery with symmetrical concept	Score Interval	Frequency distribution (N)	Percentace (%)
1	Very good	10.7 - 13	5	100%
2	Good	8.2 - 10.6	0	0%
3	Less good	5.7 - 8.1	0	0%
	Not good	3.2 - 5.6	0	0%
	Total		5	100%

The data table above shows that there is a tendency for fashion expert panelists to give a very good assessment on the categorization of the application of combination embroidery on smart casual clothing with the asymmetrical concept. This is proven by the fact that all five (5) expert panelists (100%) gave a very good assessment.

Description of Prospective User/Consumer Assessment Data

This study assesses the application of combination embroidery on smart casual clothing with a symmetrical concept using a closed questionnaire with 24 questions, with a score of 1-4 and a total score range of 20-80. From the data obtained, the lowest score is 23 and the highest is 80, with an average value (mean) of 67.01, median 70, mode 80, the highest score is 80 and tandard deviation of 13.55. The distribution of data shows that the majority of respondents gave high scores, with 47 people (35.88%) in the score interval 71-78. 18 people (13.74%) in the score interval 79-86.

Based on the categorization, 120 respondents (93.75%) rated the application of combination embroidery as "Very Good", 9 people (3.91%) rated it as "Good", 3 people (2.34%) rated it as "Less Good" and no respondents rated it as Not Good." The frequency distribution of symmetrical concept categorization can be seen in the following table 5.

Table 5. Frequency Distribution of Combination Embroidery Variables on Smart Casual Clothing with Symmetrical Concepts

No.	Score	Frequency Distribution	Percentage (%)	Category
1	≥ 60	120	93,75	Very Good
2	50 - 59	5	3,91	Good
3	40 - 49	3	2,34	Less Good
4	< 39	0	0,00	
Total		128	100	

These results show that the combination of embroidery on smart casual clothing with the Symmetrical concept is very well received by potential users, with the majority of respondents giving a positive response to the design and quality.

Furthermore, the application of combination embroidery on smart casual clothing with the Asymmetrical concept uses a closed questionnaire with 24 questions, with a score of 1-4 and a total score range of 20-80. From the data obtained, the lowest score was 23 and the highest was 80, with an average value (mean) of 67.01, median 70, mode 80, the highest score is 80 and standard deviation of 13.55. The distribution of the data shows that the majority of respondents gave high scores, with 47 people (35.88%) in the score interval 71-78 and 18 people (13.74%). In the interval 79-86.

Based on categorization, 105 respondents (82.03%) rated the application of combination embroidery as "Very Good", 14 people (10.94%) rated "Good", 5 people (3.91%) rated "Less Good", and 4 people (3.13%) rated Not Good." The frequency distribution of asymmetrical concept categorization can be seen in the following table 6.

Table 6. Frequency Distribution of Combination Embroidery Variables on Smart Casual Clothing with Asymmetrical Concepts

No.	Score	Frequency Distribution	Percentage (%)	Category
1	≥ 60	105	82,03	Very Good
2	50 - 59	14	10,94	Good
3	40 - 49	5	3,91	Less Good
4	< 39	4	3,13	Not Good
Total		128	100	

This research explores combination embroidery techniques in smart casual wear by examining the application of design elements and principles through two main concepts, namely Symmetrical and Asymmetrical concepts. The analysis was conducted through the creation of two product prototypes, each with different design characteristics.

The Symmetrical concept applies design elements in the form of curved lines, three-dimensional (3D) floral textures, opposite color combinations (double complement), symmetrical balance, and regular, repetitive, and multilevel rhythms. Meanwhile, the Asymmetrical concept uses diagonal lines, 3D floral textures, similar color combinations, obvious asymmetrical balance, and a more dynamic rhythm.

The results of the expert panelists assessment showed that the quality of combination embroidery with the Symmetrical concept obtained a score of 57.85, with the categories "very good" (80%) and "good" (20%). Meanwhile, the Asymmetrical concept obtained a score of 55.45, with a category of "very good" (100%). Both concepts showed excellence in the object quality indicator, as seen from the high scores given by the expert panelists when presented by the models.

The potential users response to the combination of embroidery on smart casual clothing also showed positive results. On the Asymmetrical concept, out of 128 respondents aged 18-50 years, 93.75% rated it "very good", 3.91% "good", and 2.34% "less good", with no one giving a "not good" rating. On the Symmetrical concept, 82.03% rated it "very good", 10.94% "good", 3.91% "not good", and 3.13% "not good".

Based on these results, it can be concluded that the Asymmetric concept is more attractive to potential users. However, both concepts are considered very good and worthy of being applied as decoration on smart casual clothing.

CONCLUSION

This study aimed to explore the use of combination embroidery techniques in smart casual wear by applying two design concepts, namely Symmetrical and Asymmetrical, in order to enhance the aesthetic value and design quality of fashion products. The research successfully addressed the issue of the lack of innovation in ornament techniques in casual fashion, demonstrating that the Asymmetrical concept had a stronger influence on consumer interest compared to the Symmetrical concept. As a result, this study contributes to the development of more creative and applicable fashion designs, particularly in improving the aesthetics and competitiveness of local fashion products. Compared to previous studies such as Wang (Wang, 2022), which focused solely on conventional embroidery application in evening wear without considering symmetrical or asymmetrical design compositions this research offers the advantage of a dual design exploratory

approach and includes potential users' evaluations as indicators of aesthetic success. Furthermore, the results align with the findings of Yuong Liu, at al (Liu et al., 2019), who emphasized the high potential of embroidery ornamentation for ready to wear fashion but highlighted the need for innovative designs to suit modern market preferences. Future research is expected to develop more varied embroidery designs using more complex techniques and materials, and to broaden their application across various fashion styles. The implication of this research is to inspire fashion designers and creative industry players to integrate aesthetics, technical innovation, and consumer preferences in producing high-value ready to wear fashion products.

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