

## Optimizing the Potential of Batik Puspita Industrial Waste for High-Quality, Sustainable Candles

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### Abstract

The Puspita batik industry in Pacitan produces significant waste, especially wax waste in the process of printing into cloth which can pollute the environment and have a negative impact on health if not managed properly. In the context of sustainable development efforts, industrial waste can be converted into high-value products through proper upcycling practices. This study aims to optimize the potential of Puspita Pacitan's batik industry waste as a high quality, sustainable wax product through upcycling. The research steps included characterization of batik waste, formulation experiments, testing the quality of upcycled wax, and environmental impact analysis. Based on the characterization of batik waste, the upcycling wax formulation was changed by adding ingredients to improve product quality and aesthetics which were then evaluated based on the parameters of burning quality, aroma, and physical appearance. Environmental impact analysis involves evaluating the life cycle of wax products to measure the efficiency of upcycling in reducing environmental impact. The results showed that Puspita Pacitan's batik industry waste could be processed into high-quality wax through proper upcycling practices. Life cycle analysis also shows the environmental impact of upcycled candles is lower than conventional candles. This research makes an important contribution to efforts to manage batik industrial waste in a sustainable manner. By optimizing the potential of Puspita Pacitan's batik waste as a high-quality wax product, upcycling can be an alternative to reduce industrial waste and increase the economic value of the product. The results of this activity can inspire other batik industries to implement upcycling practices in their operational activities.

**Keywords:** Utilization; Waste; Batik; Candle; Batik Puspita

### 1. Introduction

Puspita Pacitan is one of the most iconic batik industries in Pacitan Regency. However, the batik production process produces waste in the form of unused dyes and wax. These wastes tend to become environmental problems if not managed properly. Therefore, this project offers an innovative solution by turning this waste into high quality wax products through an upcycling process [1]–[3].

Leftover dyes and wax from the Puspita Pacitan batik industry will be collected and processed selectively. Dyes that can still be used will be reused in batik production, while unused wax will be turned into high-quality wax [4]. This upcycling process involves processing and mixing waste with environmentally friendly and safe additives [5]. The end result is a high-quality candle that can be used as a consumer product, gift or room decoration [6]–[9].

By turning batik industrial waste into high-quality wax products, the project adds value to the cultural heritage of batik, while educating the public about the importance of protecting and promoting this high-value cultural heritage.

## 2. Method

The Asset Based Community Development (ABCD) method is an approach that focuses on utilizing the resources and potential that exist within a community to strengthen capabilities and improve people's welfare. The Asset Based Community Development (ABCD) method consists of 5 stages: Discovery, Dream, Design, Define, and Destiny [6], [9]–[12]. At the Discovery stage, community assets are identified. The Dream stage involves establishing a vision and goals. The Design phase involves designing a strategy. The Define phase involves executing the action plan. The Destiny stage is the achievement of the desired result and impact.

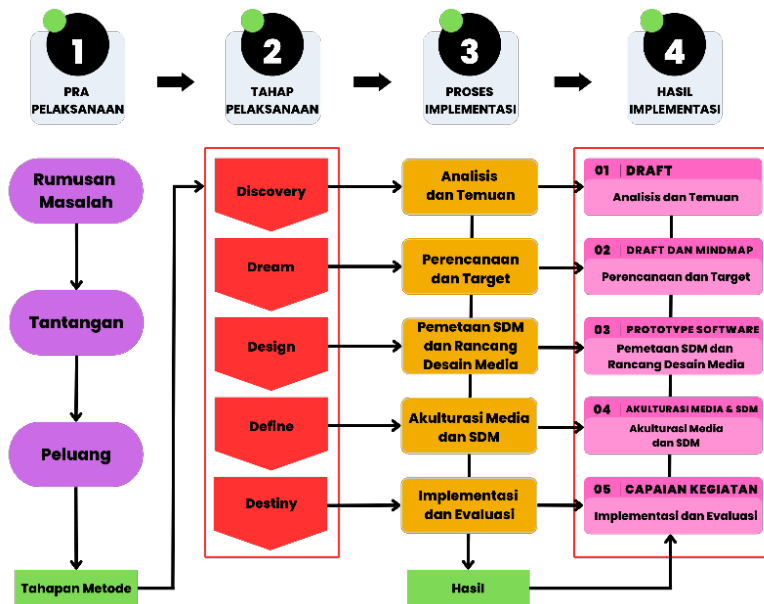


Figure 1. Implementation Stages, adapted from [13]–[15]

### 2.1 Data Collection

This data collection process was carried out by interviews, questionnaires, and documentation used to collect data. The type of data collected is quantitative for number-based validation tests and practicality test, and qualitative for needs analysis and expert validators.

### 2.2 Data dan Analisis Data

Testing the effectiveness of learning outcomes in understanding how to utilize Batik Puspita Pacitan's industrial waste into downstream worthy wax is carried out through paired sample tests. Before conducting the paired t-test, the Kolmogorov-Smirnov normality test was first performed. The hypothesis put forward is that  $H_0$  there are no differences in learning outcomes before and after implementation and  $H_a$  there are differences in learning outcomes before and after implementation. Decision making is based on the probability value if probability  $> 0.05$  then  $H_0$  is accepted and if probability  $< 0.05$  then  $H_a$  is accepted.

### 3. Results and Discussion

#### 3.1 Product Development Process



**Figure 2. Product Development Process**

The first stage, collecting tools and materials consists of: 1) Used cooking oil, 2) Essential Oil, 3) Night, 4) Stove, 5) Pot, 6) Stearin, 7) Glass Jar 350ml, 8) Candle Wick, 9) Float Axis, 10) Used Crayons, 11) Charcoal and soak used cooking oil with charcoal for 12 hours, to clean and remove the smell of used cooking oil.

The second stage, heat 165 grams of batik wax, after melting, mix it with 165 ml of used cooking oil with a ratio of 1:1. Add 110 grams of stearin, and stir until evenly distributed (the ratio of stearin and oil is 1:3), then turn off the heat.

The third stage, mix the used crayons for coloring. Add 10 mL of essential oil, then stir until smooth. Pour it into a glass glass container, then add the wick and the float. Fourth stage. Let stand until the oil cools and hardens and the aromatherapy candle is ready to use.

#### 3.2 Test Results Analysis of Participant Comprehension Test

The results of the Kolmogorov-Smirnov normality test using SPSS for Windows obtained a significance value of 0.129 so that it is greater than 0.05 or  $0.129 > 0.05$ , so the data distribution is normal. Furthermore, the effectiveness test using the paired t-test produced output in the form of (1) paired samples statistics which showed that the average value of 100 populations before using the media was 45.70 while the average value after using the media was 85.65. Based on the results of the statistical analysis, it can be concluded that there is an increase in learning outcomes. The results of the paired samples statistical analysis are presented in the following table.

**Table 1. Paired Samples Statistic**

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Sebelum	45.70	100	10.208	1.021
	Sesudah	85.65	100	4.996	.500

Furthermore, the results of the effectiveness test using the paired t test show that the value of Sig. (2 – tailed) of 0.000 is less than 0.05 or  $0.000 < 0.05$  then  $H_0$  is rejected and  $H_a$  is accepted. Based on the results of the statistical analysis, it can be seen that there is a significant difference between the values before and after the implementation so that it can

be concluded that the level of understanding. The results of the statistical analysis of the paired samples test can be seen in the following table.

**Table 2. Paired Samples Test**

		Paired Samples Test							
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Nilai Pretest - Nilai Posttest	-30.640	8.775	.877	-32.381	-28.899	-34.917	99	.000

#### 4. Conclusion

The application of Edusociopreneurship through the edusociopreneurship approach is used in this activity with the aim of combining aspects of education, social entrepreneurship, and community development. Through training and marketing of wax products, HR (Human Resources) in the Batik Puspita Pacitan community are empowered to develop candle production skills, an understanding of upcycling, and entrepreneurial skills. This allows them to create positive social and economic impacts in managing batik waste. This is the explanation that we can give, we thank the implementing partners for the activities and non-APBN funding sources, State University of Malang in 2023 and the support of Batik Puspita Pacitan's partners.

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