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Training and Educational Program on Natural Dye Shibori Technique: Enhancing Community Skills and Eco-Creativity in Semarang

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ABSTRACT

This community service activity focuses on environmental education and developing the community's creative skills through sustainable textile craft practices. The activity partners are the Kalisegoro community, Semarang, who have the potential to develop craft skills but are still limited in mastering environmentally friendly dyeing techniques and textile product innovation. The objective of this activity is to improve shibori technique skills based on natural dyes while fostering eco-creativity and environmental awareness in the community. This program was implemented for four weeks with the involvement of 25 participants. The activity stages include training and education on natural dyes, shibori printing techniques, direct practice of making shibori cloth using ketapang leaves (Terminalia catappa), as well as activity evaluation through pre- and post-training tests, observations, and interviews. The results of the activity showed a significant increase in participants' skills in making shibori with natural dyes, especially in aspects of technical competence, environmental understanding, and creative expression. The participant evaluation score increased from an average of 56.4% in the pre-training to 87.2% in the post-training. In addition to enhancing skills, this activity also has a social impact in the form of growing community collaboration, empowering women, and increasing awareness and support for sustainable fashion practices. This community service activity demonstrates that contextual, practical, and eco-creativity-oriented training is effective in increasing community capacity and contributing to the development of the creative economy and sustainable development at the local level.

Keywords: Community service, Eco-creativity, Shibori natural dye, Skills training, Sustainable textile crafts.

INTRODUCTION

Over the last several years, the global fashion and textile sector has faced increasing pressure to adopt more sustainable production practices due to the environmental degradation caused by the extensive use of synthetic dyes and chemical-based processes (Firdaus et al., 2025; Kurniawati et al., 2024). This situation has raised broader awareness of environmental issues and encouraged the development of green craft and eco-fashion practices that prioritize natural resources and environmentally friendly materials as alternatives to synthetic chemicals (Patil et al., 2025; Šabarić et al., 2024). Such developments align with the United Nations Sustainable Development Goals (SDGs), particularly Goal 12 on responsible consumption and production and Goal 8 on inclusive and sustainable economic growth through creative industries (United Nations, 2015). Within this context, capacity-building through training and education for artisans and local communities has become a crucial strategy for disseminating sustainable design practices and strengthening green vocational skills at the grassroots level (Awino, 2025; Chasanah et al., 2025; Harahap et al., 2025).

Indonesia possesses abundant natural resources that have strong potential to support environmentally friendly textile production, particularly through the use of plant-based dyes such as Terminalia catappa (ketapang) leaves (Dalengkade et al., 2025; Nurhaida et al., 2024; Saefudin & Basri, 2023). However, these resources have not been optimally utilized in community-based textile production due to limited access to structured training, insufficient knowledge transfer, and the lack

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of sustainable craft education tailored to local contexts (Andriamanantena et al., 2023; Nambela, 2023). Many local artisan groups, including craft communities in Kalisegoro, Semarang, still rely on conventional dyeing techniques using synthetic materials. Although these communities have experience in traditional textile-making, they have limited exposure to eco-friendly dyeing methods and innovative techniques such as shibori—a Japanese resist-dyeing technique that is compatible with natural dyes (Achmad & Wiratmadja, 2025). As a result, their creative capacity and economic potential remain underdeveloped within the growing green economy and sustainable creative industry sectors (Miranda et al., 2025; Saptarshi et al., 2025).

The challenges faced by the Kalisegoro community reflect broader issues encountered by many community-based craft groups in developing countries, where environmentally friendly dyeing practices and innovative design approaches are difficult to implement due to the absence of systematic and continuous training programs (Achmad & Wiratmadja, 2025; Ismail et al., 2025). In Indonesia, community empowerment initiatives in the craft sector are often short-term, fragmented, and primarily focused on production outputs rather than on the development of long-term creative, ecological, and entrepreneurial capacities (Mónaco, 2025; Shahidullah, 2025). Consequently, community members frequently struggle to sustain the skills and knowledge acquired during training and to apply them in viable small-scale businesses aligned with sustainable development principles. This condition is further exacerbated by a limited understanding of shibori as a creative technique that integrates traditional textile aesthetics with environmentally friendly dyeing processes (Darmayanti, 2022; Singh & Singh, 2025).

To address these challenges, community-based educational interventions are needed to bridge the gap between traditional craftsmanship and sustainable design practices. Training programs that combine environmentally friendly dyeing techniques with participatory and practice-oriented learning approaches have been shown to enhance not only technical skills but also environmental awareness, creative confidence, and entrepreneurial potential among participants (Aggarwal, 2024; Kusrini et al., 2025; Nurhaida et al., 2024). Such initiatives play a strategic role in enabling communities to actively participate in sustainable textile production, contribute to environmental conservation, and strengthen the local creative economy (Cuyos & Arroyo, 2025; Das et al., 2025).

Despite growing academic attention to sustainable textile processes and natural dye applications, most existing efforts remain concentrated on technical aspects such as dye extraction and color fastness or on industry-level sustainability performance (Islam et al., 2024; Pizzicato et al., 2023; Violano et al., 2023; Miranda et al., 2025; Saptarshi et al., 2025). Limited attention has been given to how these techniques can be translated into structured, community-based training models that integrate technical skills, creativity, and ecological awareness. Similarly, while shibori has been recognized for its aesthetic and cultural value (Achmad & Wiratmadja, 2025; Saleh et al., 2024), its application using locally available natural dyes and its potential as a pedagogical tool in community learning contexts remain underexplored. Furthermore, many community training programs in Indonesia lack continuity, systematic evaluation, and long-term orientation toward skill enhancement, environmental awareness, and entrepreneurial readiness (Hidayati et al., 2024; Kusrini et al., 2025).

Responding to these gaps and the specific needs of the Kalisegoro community, this community service program was designed to implement a structured training and educational initiative focusing on natural dye shibori techniques using Terminalia catappa leaves. The program aims to enhance community skills in sustainable textile production, foster eco-creativity, and strengthen environmental consciousness through practical, participatory learning activities. By integrating traditional craftsmanship with environmentally friendly practices and vocational creativity, this program seeks to support community empowerment, promote sustainable livelihoods, and contribute to the development of community-based green skills aligned with sustainable development goals (Cuyos & Arroyo, 2025; Kurnianingsih et al., 2025; Hendriyana et al., 2024; Lakshana et al., 2024).

RESEARCH METHOD

The community service program was implemented using a participatory and practice-oriented approach, emphasizing active involvement of community members throughout the training and educational activities. The approach was designed to encourage collaboration between facilitators and participants in identifying needs, implementing solutions, and reflecting on outcomes, in line with participatory community engagement principles (Kemmis et al., 2014; Stringer, 2014).

Partner Community and Participants

The partner community involved in this program was the Kalisegoro community in Semarang, consisting of residents who have an interest in textile crafts and creative activities. Participants included housewives, youth, and small-scale artisans who were willing to participate fully in the training program. A total of 25 participants were involved in the activities, representing the socio-economic and creative characteristics of the local community. Their participation was voluntary and based on readiness to engage in the full duration of the program.

Stages of Community Service Activities

The implementation of the community service program was carried out in several structured stages to ensure effective skill transfer and meaningful community engagement.

1. **Needs Assessment and Activity Planning**

The initial stage focused on identifying partner needs, existing skills, and local potential through informal interviews, group discussions, and site observations. This stage aimed to understand community challenges related to textile production, limited use of environmentally friendly dyeing techniques, and the lack of creative innovation. Based on these findings, a training plan was collaboratively developed, emphasizing shibori techniques using natural dyes derived from Terminalia catappa (ketapang) leaves and tailored to local conditions.

2. **Training and Educational Implementation**

The core activities consisted of training and educational sessions conducted over four weeks. These sessions included introductory discussions on sustainable textiles and natural dyes, demonstrations of shibori techniques, and hands-on practice. Participants were guided through fabric preparation, natural dye extraction, dye application, resist techniques, and creative pattern development. The learning process emphasized experiential learning, allowing participants to explore creative expression while applying environmentally friendly practices.

3. **Mentoring and Practice-Based Learning**

During the training period, continuous mentoring was provided to support participants in refining their techniques and developing shibori products. Facilitators encouraged collaborative learning, peer discussion, and experimentation with motifs and color variations. This stage aimed to strengthen technical competence, build creative confidence, and foster eco-creativity within the community.

4. **Evaluation and Reflection**

The final stage involved evaluating the implementation and outcomes of the community service activities. Evaluation focused on changes in participants' skills, understanding of natural dye processes, environmental awareness, and creative engagement. Reflection sessions were conducted to gather participant feedback, identify challenges encountered during the activities, and explore opportunities for sustaining and further developing the program within the community.

5. **Evaluation Techniques**

Evaluation of the community service activities was carried out using multiple techniques to capture both practical outcomes and participant experiences. These included observation of participant performance during training sessions, simple pre- and post-activity assessments to review skill and knowledge improvement, group discussions, and informal interviews to document participant perceptions. Photo and video documentation were also used to support reporting of the training process and the resulting shibori products (Denzin, 2012).

6. **Ethical** Considerations

Ethical principles were applied throughout the implementation of the community service program. Participants were informed about the objectives and activities of the program and provided

their consent before participation. Participation was voluntary, and confidentiality of participant information was maintained. The activities followed ethical standards for community engagement and empowerment, ensuring respect, inclusivity, and transparency.

RESULTS

1. Implementation of Community Service Activities

The training and educational program was successfully implemented in Kalisegoro, Semarang, involving 25 community members, including housewives, youth, and local artisans. The activities were conducted over four weeks and designed as an integrated series of learning sessions combining education, demonstration, hands-on practice, and reflection. The implementation emphasized active participation and collaborative learning, allowing participants to engage directly in each stage of the natural dye shibori process.

Participants were introduced to shibori techniques using natural dyes derived from *Terminalia catappa* (ketapang) leaves. The activities covered material preparation, dye extraction, resist binding techniques, dye immersion, and finishing processes. Throughout the training, participants worked in groups, shared experiences, and supported one another, fostering collaboration and collective learning within the community.

The staged implementation enabled participants to gradually build confidence and competence, while facilitators provided continuous guidance to ensure the techniques were applied to local conditions and available resources. This approach proved effective in encouraging sustained engagement and maximizing learning outcomes for the partner community.

Table 1. Summary of Training Sessions and Activities

Week	Focus Area	Activities	Output
1	Planning and Orientation	Needs assessment, introduction to Shibori, and natural dyes	Identified skill gaps and participant expectations
2	Technical Skill Development	Dye extraction, fabric folding, binding, and immersion techniques	Basic Shibori patterns using Ketapang dye
3	Creative Application	Design exploration, color intensity variation, and finishing	Eco-creative textile prototypes
4	Reflection and Evaluation	Exhibition, participant reflection, and feedback	Evaluation reports and improvement plans

Figure 1. Documentation of Enthusiasm of Participants in the Training on Making Natural Dye Shibori

2. Output and Skill Development Outcomes

One of the primary outputs of the community service program was the production of eco-friendly shibori textile products created by participants using ketapang-based natural dyes. These products included fabric samples and prototype textile items displaying varied patterns and color

intensities. Compared to initial practice attempts, the final outputs demonstrated clearer motifs, improved color consistency, and better finishing quality.

Evaluation of the activities indicated a substantial improvement in participants' technical skills related to natural dye shibori production. The average evaluation score increased from 56.4% before the training to 87.2% after the completion of activities, reflecting enhanced understanding of dye preparation, resist techniques, and safe working practices. This improvement illustrates the effectiveness of structured, hands-on training in strengthening vocational skills within a community-based setting.

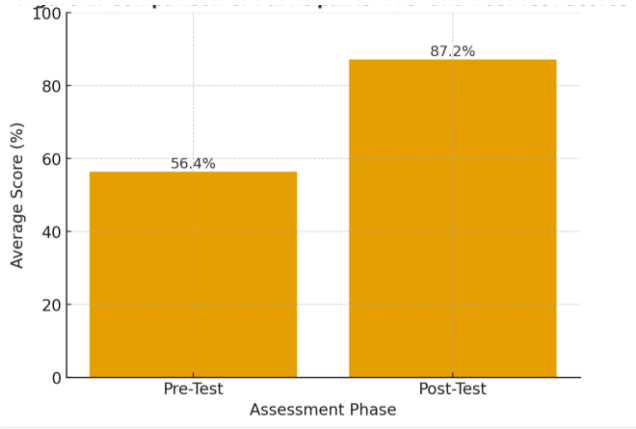

Figure 2. Comparison of Participants' Pre- and Post-Test Scores

Beyond technical competence, participants reported increased confidence in applying the techniques independently. Several participants expressed readiness to reproduce the process at home using locally available materials, indicating that the training successfully transferred practical and applicable skills to the community.

3. Development of Eco-Creativity and Environmental Awareness

In addition to technical skill enhancement, the program contributed significantly to the development of eco-creativity and environmental awareness among participants. Through direct engagement with natural materials, participants gained a deeper appreciation of environmentally friendly practices and the potential of local resources for sustainable textile production.

Participants demonstrated increased creativity by experimenting with color variations, resist patterns, and motif designs inspired by local flora and cultural elements. The training environment encouraged experimentation and learning through practice, allowing participants to view mistakes as part of the creative process. This approach helped nurture creative confidence and originality in product development.

Environmental awareness was also strengthened, as participants became more conscious of waste reduction and sustainable material use. Several participants reported reusing leftover dye solutions to produce lighter color tones and minimizing fabric waste by creating smaller craft items. These practices indicate that the program successfully embedded sustainability principles into participants' daily craft activities.

Table 2. Emerging Themes from Qualitative Data

Theme	Description	Example Quote
Eco-Awareness	Understanding the ecological benefits of natural dyes	"I realized that Ketapang leaves can give beautiful colors without harming the environment."
Creative Experimentation	Exploration of design and color variation	"I tried combining Shibori patterns with batik-inspired motifs."
Sustainable Practice	Application of green principles in daily craftwork	"Now I use leftover dye water for lighter tones instead of throwing it away."

Figure 3. Creativity of Training Participants in the Training on Making Natural Dye Shibori

These findings demonstrate that the integration of creative education with environmental content can effectively nurture eco-creativity within community-based learning settings.

4. Community Empowerment and Socio-Economic Benefits

The community service program generated meaningful empowerment outcomes beyond individual skill development. One notable impact was the emergence of collective initiatives among participants, including the formation of a small working group named *"Shibori Hijau Kalisegoro."* This group aims to sustain collaborative production efforts and explore market opportunities for eco-friendly textile products.

Participants expressed increased confidence in the economic potential of their products, highlighting the uniqueness and environmental value of natural dye shibori textiles. The training also strengthened social cohesion within the community, as collaborative activities fostered mutual support, shared problem-solving, and a growing sense of pride in local creative identity.

These outcomes suggest that eco-creative training programs can catalyze community-based economic activities while reinforcing sustainable values. By linking creative skills with environmental responsibility, the program contributed to building a foundation for sustainable livelihoods within the partner community.

5. Evaluation of Program Benefits and Sustainability

Participant feedback indicated a high level of satisfaction with the relevance, practicality, and delivery of the training activities. Most participants perceived the program as beneficial for improving both technical skills and creative capacity, as well as for increasing awareness of sustainable textile practices. The participatory and experiential learning approach was identified as a key factor in maintaining motivation and facilitating knowledge retention.

Program evaluation highlighted positive participant experiences, with an appreciation of how relevant the training content was. According to the post-program survey, 92% of participants described the materials as "very relevant," and 88% stated the training boosted their technical and creative abilities.

Table 3. Participant Satisfaction Survey Summary

Evaluation Indicator	Percentage (%)
Relevance of materials	92
Practical applicability	90
Facilitation quality	94
Creativity stimulation	88
Environmental awareness improvement	91

The program encountered challenges such as limited equipment access, the weather causing uneven dye quality, and insufficient time for creative deepening. However, the resource-sharing collaboration and scheduled follow-up workshops proposed by the participants and facilitators worked as practical answers. The reflective phase underscored the importance of the program's participatory and experiential aspects in maintaining motivation and enabling the retention of knowledge.

Challenges encountered during implementation included limited equipment availability, weather-related variations in dye results, and time constraints for deeper creative exploration. However, these challenges were addressed through resource sharing, group collaboration, and plans for follow-up activities proposed jointly by facilitators and participants.

Overall, the evaluation highlights that the program not only achieved its immediate objectives but also created opportunities for continued learning and community-driven development. The participatory nature of the activities played an essential role in ensuring that the benefits of the program extended beyond the training period.

6. Summary of Community Service Outcomes

The community service program successfully enhanced participants' skills in natural dye shibori techniques, strengthened eco-creativity, and increased environmental awareness within the Kalisegoro community. The tangible outputs in the form of eco-friendly textile products, combined with increased confidence and collaborative initiatives, demonstrate the positive impact of the program on the partner community.

By integrating traditional textile practices with environmentally responsible techniques and creative education, the program contributed to community empowerment and sustainable local development. These findings affirm that community-based eco-creative training can play a vital role in developing green skills, supporting creative economies, and promoting sustainable practices at the grassroots level.

Figure 4. Training results of Natural Dye Shibori

DISCUSSION

The implementation of the natural dye shibori training program demonstrates that community-based, experiential learning activities can generate meaningful impacts on partner communities, particularly in terms of skill enhancement, eco-creativity development, and environmental awareness. The observed improvements in participants' technical competence and confidence indicate that learning through direct practice, reflection, and experimentation is highly effective in community service settings. This aligns with experiential learning principles, which emphasize learning as a process constructed through active experience and reflective engagement (Kolb, 1984). By engaging participants directly in fabric folding, resist techniques, and pigment extraction using Terminalia catappa leaves, the program enabled learning at both cognitive and practical levels.

The participatory nature of the activities also reflects the core principles of participatory action and community-based education, where learning is embedded in collaboration, shared reflection, and empowerment rather than one-way knowledge transfer (Causing et al., 2024; Lam et al., 2020; Widaningsih & Sari, 2021). The high level of participant engagement and the positive outcomes of post-activity evaluations suggest that contextual, hands-on approaches are particularly suitable for developing green vocational skills in local craft communities. These outcomes reinforce previous findings that experiential and locally grounded pedagogies are effective in fostering both technical competence and environmental consciousness (Taksono & Wibawa, 2023).

From a practical perspective, the community service program produced tangible outputs in the form of eco-friendly shibori textile products, which serve as concrete evidence of skill transfer and creative application. Beyond product creation, the program contributed to strengthening participants' eco-creative capacity, as reflected in their ability to experiment with patterns, color intensities, and culturally inspired motifs. The integration of traditional craftsmanship with environmentally responsible practices illustrates that shibori-based natural dye training can function as an accessible and adaptable educational model for promoting sustainable skills in community contexts. This finding supports broader discussions in green vocational and sustainable craft education that highlight the importance of combining environmental literacy, creative practice, and community empowerment (Henriksen et al., 2024; Zhang & Shen, 2024).

The benefits of the program extended beyond individual skill development to include broader community empowerment outcomes. The emergence of collaborative initiatives among participants, such as collective production planning and interest in small-scale eco-friendly enterprises, indicates that the training contributed to strengthening social capital and economic potential within the partner community. Such outcomes align with literature emphasizing that community-based training can support inclusive and sustainable livelihoods when skill development is linked with environmental responsibility and creative identity (Aggarwal et al., 2024; Ye et al., 2024). The use of locally available resources, such as ketapang leaves, further enhanced the relevance and sustainability of the program by reducing dependency on external materials while reinforcing local ecological knowledge.

Despite these positive impacts, several limitations were identified during the implementation of the community service activities. The program involved a relatively small number of participants from a single community, which may influence the transferability of outcomes to other socio-cultural contexts. Additionally, the four-week duration limited opportunities to observe long-term skill retention, business development, and sustained eco-creative practices. Variations in participants' prior experience, motivation, and learning pace also affected the depth of skill acquisition and creative exploration. Environmental factors, including weather conditions affecting dye consistency and the seasonal availability of ketapang leaves, posed practical challenges to replication. Furthermore, evaluation activities primarily focused on observable outcomes and basic quantitative indicators, while deeper qualitative dimensions—such as long-term environmental attitudes—require further exploration.

These limitations suggest opportunities for future community service initiatives rather than diminishing the value of the program. Follow-up activities, longer-term mentoring, and repeated training cycles could help strengthen skill retention and support the transition from training outputs to sustainable micro-enterprises. Expanding the program to diverse communities would also enable comparative learning and adaptation across different local contexts. In addition, integrating digital learning tools—such as instructional videos, online modules, or virtual demonstrations—could enhance accessibility, scalability, and continuity of eco-creative training, particularly for communities with limited access to in-person facilitation (Bouichou et al., 2024; Caingcoy, 2025; Zahirah et al., 2025).

Beyond technical and economic benefits, the community service program carries important social and ethical implications. The collaborative learning environment fostered empowerment, self-efficacy, and solidarity among participants, particularly women, contributing to inclusive community development and gender-sensitive empowerment practices. This aligns with sustainability perspectives that position community resilience and social equity as integral components of green economy initiatives (Santos et al., 2025; Sarkki et al., 2024). Ethically, the use of natural dyes reflects a commitment to environmental stewardship, reduced ecological impact, and respect for local wisdom. The reinterpretation of shibori through local materials also highlights the ethical value of preserving cultural heritage while adapting it to contemporary sustainable practices.

Overall, the discussion underscores that sustainability-oriented community service programs should not only aim for ecological efficiency but also promote cultural continuity, social inclusion, and ethical responsibility. The natural dye shibori training program illustrates how integrated training

and educational strategies can generate practical benefits for partner communities while contributing to broader goals of sustainable development and eco-creative empowerment.

CONCLUSION

This community service program demonstrates that the training and educational activities on the natural dye Shibori technique successfully achieved their primary objectives in addressing the partner community's needs in Kalisegoro, Semarang. The program effectively enhanced participants' technical skills in textile dyeing, fostered eco-creative thinking, and increased environmental awareness through hands-on, participatory learning activities. By utilizing locally available Ketapang leaves (Terminalia catappa) as natural dye materials, the program not only introduced environmentally friendly production practices but also strengthened participants' understanding of sustainable resource utilization rooted in local potential.

The tangible outcomes of this community service activity include improved participant competencies in Shibori techniques, the production of eco-friendly textile products, and the emergence of new creative ideas with potential economic value. Beyond technical outputs, the program contributed to strengthening community confidence, collaboration, and motivation—particularly among women and small-scale artisans—to explore sustainable craft-based livelihood opportunities. These achievements indicate that experiential and community-based training can function as an effective empowerment strategy, integrating skill development, environmental responsibility, and local cultural appreciation.

Overall, the implementation of the natural dye Shibori training affirms that eco-creative community service initiatives can serve as a practical model for sustainable skills development at the grassroots level. The program provides a replicable framework for similar communities seeking to develop environmentally responsible creative industries using local resources. Future community service programs are encouraged to expand participant reach, incorporate follow-up mentoring or digital learning support, and strengthen market access to ensure the long-term sustainability and broader socio-economic impact of eco-creative empowerment initiatives.

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