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Ecoprint Steaming Technique for Interactive and Eco-Friendly Learning Among Primary Teachers at SD Gugus Dham Lubuk

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Abstract

This community engagement project addresses the limited use of interactive, environmentally friendly teaching methods in primary education, particularly among teachers at SD Gugus Dham Lubuk, Aceh Besar. The study aimed to introduce and train teachers using the ecoprint steaming technique as an innovative learning approach that integrates environmental sustainability with hands-on art-based activities. The program followed a structured process of socialization, training, classroom application, and mentoring, involving 30 teachers in demonstrations and practice using natural materials such as leaves and flowers. Before the training, 85% of teachers had never been exposed to ecoprint and still relied on lecture-based methods that limited creativity and engagement. Post-training results indicated increased teacher participation, creativity in lesson planning, and readiness to apply ecoprint in classrooms. Teachers successfully integrated the method into science and art lessons, enhancing student engagement while fostering environmental awareness. Beyond these immediate outcomes, sustainability measures were established through digital modules, a class "ecoprint corner", and continuous mentoring with local stakeholders. These efforts ensure long-term adoption of interactive, eco-friendly teaching practices. Furthermore, the initiative demonstrated the potential for sustainable creative economy activities, as teachers and students produced marketable products showcased in a school exhibition, linking education with environmental stewardship and local economic empowerment.

Keywords Eco-friendly; Ecoprint; Interactive learning

1. INTRODUCTION

The fashion sector is one of the industries that significantly impacts the environment, particularly due to textile waste and the use of synthetic chemicals in the dyeing process. In recent years, awareness of these environmental impacts has grown, driving the search for more sustainable alternatives. One emerging method is the ecoprint technique, which uses natural materials such as leaves and flowers to create patterns on fabric without harmful chemicals. As a form of art and craftsmanship, ecoprint involves visual elements and the application of sustainability values in the design and production of fashion and textile art (Sarani et al., 2020). This is supported by research from Williams and Reddy (2019), which shows that ecoprint reduces negative environmental impacts and supports biodiversity by utilizing various plants as sources of natural dyes. According to Boon et al. (2018), the process involves placing leaves or other organic materials on fabric, then heating them using steam or other methods, allowing the natural colors and patterns of the materials to transfer onto the fabric.

The target partners of this program are teachers at SD Gugus Dham Lubuk, Aceh Besar, located 9.5 kilometers from Universitas Muhammadiyah Aceh. Based on initial observations and discussions with the school, it was found that there are still limitations in the teaching methods used. The learning process relies heavily on traditional techniques emphasizing theoretical knowledge rather than practical application. This results in low student engagement and a lack of innovation in teaching approaches. Geographically, SD Gugus Dham Lubuk is situated in an area with abundant natural resources, including various types of leaves and flowers that can be used in ecological printing processes. However, the utilization of these natural materials remains suboptimal in both the education and creative economy sectors. A lack of knowledge and skills among teachers regarding practice-based learning methods and eco-printing technology is one of the main barriers to implementing this concept in schools.

Furthermore, Aceh Besar is rich in local cultural traditions, which present a valuable opportunity to incorporate ecoprint to preserve traditional arts and culture. By using local flora in the ecoprinting process, this activity promotes environmental sustainability and introduces students and teachers to the cultural values embedded in the natural motifs produced. The participants in this program were teachers from SD Gugus Dham Lubuk, who play a vital role in shaping the mindset and skills of students at the primary education level. The total number of teachers in this cluster is 55, representing four schools, with 30 selected to participate in this activity. Based on

the initial survey, most teachers still rely on traditional teaching methods and are unfamiliar with project-based learning or hands-on instructional approaches. The lack of adequate training and resources has been a major factor contributing to the limited innovation in their teaching practices.

Abundant natural resources, such as various leaves and flowers suitable for eco-printing, surround SD Gugus Dham Lubuk. These materials are readily available around the school environment and can be accessed without additional cost. However, the absence of training programs to equip teachers with the necessary skills to utilize these resources has been a primary obstacle in implementing ecoprint as a teaching method.

Socially, the community around the school has a strong tradition of cooperation, and local initiatives are well supported. However, limited access to information and training on innovative teaching methods and eco-printing technology remains challenging. Through this training, teachers are expected to adopt eco-printing as an interactive teaching method and transfer these skills to their students and the surrounding community.

The preliminary findings revealed that a considerable majority of teachers, approximately 85 percent, lacked familiarity with ecoprint as an instructional medium. In contrast, only 15 percent reported having prior knowledge of the technique, yet none had attempted to implement it within their teaching practices. These findings highlight the necessity of a program designed to introduce and train teachers at SD Gugus Dham Lubuk in applying ecoprint. The program seeks to establish ecoprint as an innovative, interactive, and environmentally sustainable learning method. By integrating this approach into classroom practice, teachers are expected to enhance their pedagogical creativity, encourage greater student participation, and instill an awareness of environmental conservation by drawing upon locally available natural resources.

In addition to the professional benefits for teachers, the program also generates direct learning opportunities for students. Implementing ecoprint provides experiential, hands-on activities that foster creativity, innovation, and exploratory skills. This approach resonates with the study conducted by Paleenud, Tanprasert, and Waleeittipat (2024), which demonstrated that project-based learning facilitates deeper understanding and sustained student engagement, unlike lecture-based instruction that often results in superficial learning outcomes. Furthermore, ecoprint serves as an early introduction for students to concepts of sustainability and environmental responsibility, equipping them with essential values that can shape their attitudes and

behaviors toward ecological preservation from a young age.

This program is expected to foster synergy between education, environmental awareness, and the creative economy, offering long-term benefits for teachers, students, and the wider community around SD Gugus Dham Lubuk, Aceh Besar. Beyond improving teaching quality, this initiative also has the potential to generate environmentally based creative economic opportunities with broader future impacts.

The real problem faced by teachers was not only the lack of awareness about ecoprint but also the limited capacity to design interactive learning activities that align with the demands of the primary curriculum. Traditional lecture-based teaching approaches often left students passive and disengaged. Moreover, environmental education had not yet been integrated meaningfully into lesson delivery. This program therefore responds directly to three interrelated challenges: (1) low teacher creativity in classroom practice, (2) underutilization of abundant local natural resources, and (3) the absence of environmental values in early education. By framing ecoprint as both a pedagogical tool and a cultural practice, this activity positioned teachers not as passive recipients of training but as active collaborators in designing, testing, and sustaining innovative learning methods.

2. METHODS

The implementation strategy for this program was carefully structured to ensure that teachers at SD Gugus Dham Lubuk could adopt ecoprint as an engaging, environmentally friendly teaching method. It began with a socialization phase in which the project team presented the concept of ecoprint, its educational relevance, and the expected outcomes to school leaders and teachers. Open discussions followed, allowing teachers to voice their expectations and needs, while the team outlined a clear schedule for training and on-site mentoring.

During the training phase, teachers received hands-on instruction in steam-based ecoprint. Sessions opened with an introduction to the required materials and tools, proceeded to step-by-step demonstrations—covering material selection, steaming, and color fixation—and culminated in guided practice. Structured reflections helped participants troubleshoot challenges and refine their technique.

Technology integration supported both practice and dissemination. Teachers learned to use steamers or large steam pots to achieve durable motifs, and every stage of the process was digitally documented for evaluation and future reference. All training resources—videos, slide decks, and illustrated guides—were available online so teachers could revisit them anytime.

Ongoing mentoring and evaluation ensured effective classroom transfer.

Project staff observed live lessons, interviewed teachers and students about the approach's impact, and compiled evaluation reports highlighting successes and obstacles. Findings informed iterative improvements and reinforced teacher confidence in using ecoprint.

To guarantee sustainability, the program produced digital modules, set up a small "ecoprint corner" stocked with natural materials and tools, and forged partnerships with local stakeholders—such as the village women's association (PKK)—to provide continued support and extend ecoprint skills beyond the school.

A participatory, technology-enabled approach underpinned every stage. Teachers and students were active collaborators, while digital tools amplified documentation, sharing, and community outreach. Teachers attended training, implemented ecoprint in their lessons, and offered constructive feedback; students engaged in ecoprint-based learning across art and science, experimented with designs, exhibited their work in school and community events, and became advocates for eco-friendly practices among peers and family members.

Program evaluation combined classroom observations, teacher satisfaction interviews, and reflective discussions to measure comprehension, identify constraints, and shape subsequent action plans. This comprehensive cycle of preparation, practice, mentorship, and review created a robust foundation for lasting integration of ecoprint into the school curriculum, fostering creativity, environmental awareness, and community engagement.

In short, the method applied in this community service program is Community-Based Research (CBR). This approach emphasizes collaboration by involving community members, researchers, and other stakeholders as active participants throughout the research process. Within community service (PkM), CBR highlights the principles of mutual learning, empowerment, and the pursuit of practical solutions to real-world problems.

One of the central features of CBR is the establishment of collaborative partnerships. The research is conducted on the community and with the community, as members are co-researchers who actively contribute to the planning, implementation, and evaluation stages. CBR is also problem-oriented and contextual, seeking to identify and address the community's challenges. By grounding the research in social, cultural, and environmental contexts, the outcomes are ensured to be both relevant and applicable.

Another essential characteristic of CBR is capacity building. The approach aims to strengthen the community's ability to address its problems by transferring

knowledge and skills through participatory training, mentoring, and continuous support. At the same time, CBR aspires to create a sustainable impact. The outcomes are academic and practical, designed to bring long-term benefits that the community can sustain and continue to apply even after the program concludes. Equally important, CBR prioritizes ethical and inclusive practices by ensuring transparency, inclusiveness, and respect for local wisdom and values.

By applying the CBR method in this activity, universities can respond more effectively to community needs while enhancing student learning and fostering civic engagement. This approach bridges academic expertise and local knowledge, ultimately contributing to meaningful and lasting social change.

In line with the Community-Based Research (CBR) framework, the teachers were not only trainees but also co-researchers who participated in designing the training modules, reflecting on challenges, and suggesting adaptations to make ecoprint more relevant for their classrooms. For instance, teachers proposed linking ecoprint to science lessons on photosynthesis and to art classes on texture and motif exploration. Evaluation was carried out through classroom observations and structured reflection sessions. It was found that 85% demonstrated mastery of key steps, including fabric preparation, steaming, and color fixation. A flowchart of activities (from socialization, training, classroom application, reflection, and sustainability planning) was developed to guide the process and ensure systematic documentation. This participatory design highlights how CBR principles were operationalized to strengthen ownership and ensure long-term impact.

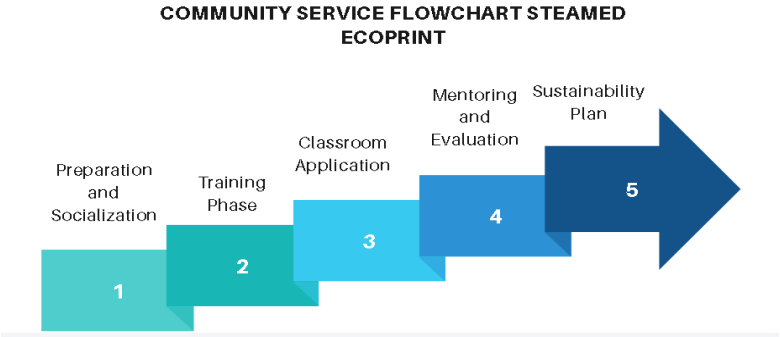

Figure 1. Flowchart of the Steamed Ecoprint Community Service

3. FINDINGS AND DISCUSSION

3.1. Findings

Ecoprint is a technique that combines art, sustainability, and local culture by utilizing natural resources found in the surrounding environment. Through ecoprint,

we create aesthetically valuable works and contribute to environmental conservation and the use of natural materials in art and design (Sarani et al., 2020).

Ecoprint is a method that allows the shapes and colors of plants to be directly applied onto fabric (DS & Alvin, 2019). The ecoprint process can be carried out using various approaches, such as boiling, steaming, and pounding techniques (Nurliana et al., 2021). This technique provides creative freedom to produce unique patterns and colors on fabric, per the maker's preferences and imagination. With the various techniques available, ecoprint offers multiple ways to create visually interesting and distinct outcomes in textile art. According to Simanungkalit (2020), the three main ecoprint techniques are pounding, boiling, and steaming. Steaming is similar to boiling, but in this method, the fabric is steamed rather than immersed in water. Both techniques offer different yet comparable ways to transfer the natural motifs and pigments from plants to fabric.

The ecoprint technique is important in developing children's fine motor skills, allowing them to learn and discover unique and engaging experiences through the activity (Fatmala & Hartati, 2020). Using the ecoprint technique to create batik enables children to produce rich and creative works while enhancing their fine motor abilities (Wahyuningrum & Watini, 2022). Essentially, such creative activities reflect children's instincts. Moreover, batik-making or ecoprint techniques are a visual art form involving decorative patterns, attracting strong public interest. Batik fabric, known for its distinctive designs, has become a symbol that enriches cultural heritage due to its unique motifs and patterns.

Synthetic dyes widely used in the textile industry often contain harmful chemicals that can pollute water and soil, negatively affecting ecosystems and human health. The production and use of synthetic dyes require significant energy and produce toxic waste that is difficult for the environment to break down. Long-term, using non-eco-friendly synthetic dyes can exacerbate environmental degradation, including water pollution, soil quality decline, and biodiversity loss (Eklund et al., 2019).

In contrast, ecoprint uses natural materials, such as leaves, bark, and flowers, readily available in our surroundings. These natural dyes do not contain harmful chemicals, thus minimizing pollution and environmental damage. Furthermore, these materials can be sourced sustainably and often do not require intensive industrial processing, reducing the carbon footprint. Research by Bilgen et al. (2021) revealed that ecoprint can be a more eco-friendly alternative than synthetic dyeing techniques. Their study demonstrated that ecoprint can produce a wide range of vibrant and aesthetic

colors without contributing to environmental pollution. By using renewable natural resources, this technique significantly reduces the negative impact on the environment.

The steam-based ecoprint training proved to be an exceptionally engaging initiative for the teachers of SD Gugus Dham Lubuk. Evidence of its appeal was clear in the high attendance rate, lively participation during every session, and the enthusiasm teachers displayed from the first introductory workshop to the final hands-on practicum. Of the thirty teachers selected to join the program, virtually all expressed keen interest not only while absorbing the theoretical background of natural dye chemistry and textile preparation, but also during the practical stages in which they arranged local leaves and flowers on fabric, bound their bundles, and anxiously awaited the reveal of vivid organic motifs emerging from the steamer.

Figure 2. The introduction to ecoprint making with the steaming technique

Many participants emphasized that the training differed from previous professional-development events because it blended artistic skills, the mindful use of nearby natural resources, and a fully project-based learning approach. This combination encouraged teachers to rethink their classroom routines: instead of relying solely on lecture and textbook work, they began imagining lessons in which students explore, experiment, and create tangible products. Several teachers remarked that the workshop sparked fresh ideas for designing thematic units that bridge science, art, and environmental education—for example, a module in which students study leaf biology, document local plant species, and then capture each specimen's unique pigments through ecoprint.

Figure 3. The Process of Making Ecoprint with the Steaming Technique

Figure 4. The Process of Making Ecoprint With the Steaming Technique

An immediate outcome of the training was integrating ecoprint activities into lesson plans for art and science subjects. Under guided supervision, teachers drafted learning objectives tied to the national curriculum, aligned assessment rubrics with hands-on competencies, and scheduled class periods for dye-bath preparation, steaming, and post-project reflection. Several participants have already piloted these plans, reporting that students become noticeably more attentive when lessons culminate in colorful, tactile artifacts they can display and discuss. Inspired by these early successes, some teachers plan a school-wide exhibition where pupils will showcase their ecoprint creations alongside explanatory posters detailing the ecological benefits of natural dyes. Others envision using student-made textiles as environmentally themed classroom décor or as merchandise—such as tote bags or bookmarks—to support school fundraising efforts.

Socially, the program strengthened cooperation among the school, the university's community-service team, and the surrounding neighborhood. Because leaves and flowers were sourced directly from the schoolyard and local gardens, the activity revived a gotong-royong (togetherness) spirit: parents volunteered to collect

plant material, and community elders shared knowledge about traditional dye plants. This collective effort reinforced local cultural pride, reminding participants that Aceh's biodiversity and artisanal heritage are valuable assets.

Economically, the training opened new possibilities for revenue generation. Teachers learned basic costing and small-batch production techniques, recognizing that ecoprint items—ranging from handkerchiefs to table runners—could serve as unique souvenirs for school events or as community-based creative products marketed to tourists. Such prospects contribute to a broader vision in which environmentally responsible craft becomes both an educational tool and a micro-enterprise that benefits the wider village.

Figure 5. The Product of Steamed Ecoprint

The program has gone beyond simply building teacher capacity; it has laid the groundwork for a holistic model that intertwines environmental stewardship, experiential learning, cultural preservation, and local economic empowerment. By positioning ecoprint at the heart of classroom practice and community engagement, SD Gugus Dham Lubuk is taking an important first step toward a greener, more creative, and more economically resilient school ecosystem.

3.2. Discussion

The primary objective of this program was to introduce and implement the ecoprint steaming technique as an innovative, environmentally friendly teaching method among primary school teachers at SD Gugus Dham Lubuk. The results demonstrate that this objective was met successfully, as evidenced by the high engagement, increased teacher creativity, and early integration of ecoprint into classroom practices. These outcomes directly address the challenges identified in the introduction, namely the reliance on traditional, lecture-based methods and the underutilization of local natural resources in the learning process.

The enthusiasm and willingness of the teachers to adopt ecoprint suggest a readiness for pedagogical transformation when appropriate training and contextual

relevance are provided. The method's hands-on, project-based nature aligns with findings from Paleenud et al. (2024), emphasizing that project-based learning leads to deeper understanding and greater student involvement than conventional approaches. Integrating ecoprint into lesson planning for science and art further reinforces the value of cross-disciplinary, experiential learning. It supports that sustainability education can be effectively embedded in early education.

From a scientific perspective, adopting ecoprint also has a strong theoretical grounding. Studies by Sarani et al. (2020) and Williams & Reddy (2019) have shown that ecoprinting techniques contribute to both environmental education and biodiversity awareness. Our findings align with this view, as teachers learned about the process and began understanding the ecological significance of using natural dyes and materials. This connection between ecological responsibility and pedagogy is consistent with global educational trends emphasizing sustainability across curricula.

Furthermore, the local context—rich in natural foliage and supported by a culture of cooperation—proved to be a key enabler for this program. The ease of sourcing materials and the community's positive reception mirror findings in Boon et al. (2018), who note that community-based ecoprinting initiatives are more successful when grounded in local culture and ecology. The participation of community members and parents also amplified the reach of the program beyond the school, indicating its potential to foster broader ecological literacy.

However, one distinct finding in this project is the gap in prior exposure to ecoprint among teachers—85% had no previous knowledge of the technique. This highlights the need for targeted, skill-based training in sustainable practices, particularly in rural or underserved educational settings. While other studies have typically focused on students or artisans, our focus on teacher training offers a new perspective that places educators at the center of change, equipping them to become sustainability ambassadors within their classrooms and communities.

Future research and development efforts could explore long-term student learning outcomes from ecoprint-based lessons, comparative studies between urban and rural school adoption, and the commercialization potential of student-crafted ecoprint products. In addition, further exploration of integrating local cultural motifs into ecoprint designs may enhance cultural relevance and identity-building within the curriculum.

In conclusion, this project confirmed the feasibility and effectiveness of implementing ecoprint in a primary school setting and positioned it as a promising model for interdisciplinary learning and environmental engagement. The results

reaffirm the importance of contextual, participatory, and sustainable approaches in modern education. Quantitative data strengthened the descriptive findings: post-training observation showed that 90% of teachers felt more confident designing interactive lessons, and two teachers had already piloted ecoprint in their classrooms by implementing it in the lesson plan (science and arts subjects). Observations also recorded a notable increase in student engagement, with teachers reporting that all students actively participated in ecoprint sessions compared to traditional lessons. These findings align with project-based learning theory, which emphasizes the role of hands-on experiences in fostering deeper understanding and creativity (Almulla, M. 2020). Moreover, the collaboration between teachers and students illustrates the principles of environmental education and teacher professional development, where innovation emerges through shared responsibility and local knowledge. The creative economy potential also moved beyond speculation: teachers and students produced five pieces of ecoprint fabric. This demonstrates that the program enriched pedagogy and opened pathways for economic empowerment.

Figure 6. The product of steamed ecoprint

Figure 7. Handover of ecoprint steaming product to village officials for program sustainability

4. CONCLUSION

This study has successfully demonstrated that implementing the ecoprint steaming technique as a learning method can enrich classroom instruction, enhance teacher creativity, and promote environmental awareness among both teachers and students. The program addressed the core objective of transforming conventional teaching approaches into more interactive, engaging, and sustainable practices by focusing on hands-on, project-based learning. Integrating local natural resources into the learning process contextualized the content and connected educational activities with community values and ecological stewardship.

Beyond the immediate impact on teaching practices, the program opened opportunities for creative economic initiatives within the school and the surrounding community. Teachers began to see ecoprint as a pedagogical tool and a potential source of innovation and entrepreneurship. This indicates a broader implication of the study—that sustainability-focused education can intersect meaningfully with local economies and cultural preservation.

Future research should examine the long-term effects of ecoprint-based learning on student outcomes, including creativity, environmental attitudes, and interdisciplinary knowledge. Comparative studies between different regions or educational levels could also provide insights into scalability and adaptability. A further area of exploration lies in developing curriculum frameworks and policy recommendations to support the institutionalization of environmentally integrated teaching methods. Some of these efforts are underway through follow-up teacher mentoring and ongoing collaboration with local stakeholders.

This program has effectively addressed the identified problems—low teacher creativity, underutilization of local natural resources, and the absence of environmental integration in learning—by providing a sustainable, community-driven solution. The outcomes include significant improvements in teacher knowledge (85% mastery), classroom adoption, and student engagement. To ensure sustainability, the program recommends three follow-up strategies: (1) continuous mentoring by university partners, (2) formal integration of ecoprint into the local primary school curriculum, and (3) expansion of training to other schools in Aceh Besar. At the policy level, collaboration with local education authorities is needed to institutionalize ecoprint as a model for environmentally integrated pedagogy. While the program faced limitations such as short duration and limited steaming equipment, its participatory approach and strong community support provide a foundation for long-

term continuity. Thus, ecoprint emerges as a creative teaching medium and a bridge between education, cultural preservation, and sustainable local economies.

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