

The Effectiveness of Recycling Maumere Woven Fabric Scraps in Developing Creativity and Environmental Awareness Character among Students at SDK Bhaktiarsa Maumere

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ABSTRACT

This study aims to examine the effectiveness of a recycling program using Maumere woven fabric scraps to enhance creativity and environmental awareness character among elementary school students. A quasi-experimental method with a One-Group Pretest-Posttest Design was employed. The research subjects consisted of 35 fifth-grade students at SDK Bhaktiarsa Maumere, selected through purposive sampling. Data collection instruments included a creative product assessment rubric and a Likert-scale questionnaire measuring environmental awareness character. Data were analyzed using a Paired-Samples t-Test. The results indicated a significant increase in the students' mean creativity score, from 62.40 (fair category) to 84.15 (very creative category). Environmental awareness character also increased from 58.50% to 81.20% following the intervention. Statistical testing confirmed a p-value of < 0.001 , demonstrating that the use of culture-based local waste is effective as an ecological and motor-skills learning medium. This study concludes that integrating handicrafts based on local wisdom can transform textile waste into a character education medium that positively impacts elementary school students in urban-cultural settings.

Keywords: Maumere Woven Fabric Scraps; Creativity; Environmental Awareness; Character Education; Elementary School.

How to Cite

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INTRODUCTION

Education at the elementary school level plays a crucial role in establishing the cognitive, affective, and psychomotor foundations of students. During this developmental stage, children possess high mental plasticity, allowing character values, lifestyle habits, and creative thinking skills to be optimally instilled and maintained into adulthood. However, empirical realities in the field indicate that elementary education systems are often trapped in conventional learning patterns that place excessive emphasis on theoretical cognitive aspects. Consequently, opportunities for developing motor creativity and internalizing character values based on the realities of the surrounding environment are often neglected. In fact, the challenges of the 21st century require education systems to produce a generation that is not only academically intelligent but also adaptive, innovative, and highly socially and ecologically aware of the environment in which they live and grow.

One of the global environmental issues that has now developed into a local crisis in various regions is the accumulation of solid waste, including textile waste. In Sikka Regency, East Nusa Tenggara, particularly in Maumere City, the ikat weaving creative industry has developed rapidly as a pillar of the community's cultural economy. Maumere weaving is not merely an economic commodity but also a highly valued cultural heritage rich in philosophical values, social identity, and communal aesthetic expression. Nevertheless, the increasing volume of ikat fabric production has generated a side effect that has not yet been systematically mitigated, namely the accumulation of fabric scraps. These woven fabric scraps are generally thick and relatively rigid and are difficult to decompose naturally because they are often combined with modern synthetic threads. A common waste-management practice among local communities is open burning, which directly releases harmful emissions into the atmosphere and contributes to deteriorating air quality in the urban area of Maumere.

On the other hand, educational institutions such as SDK Bhaktiarsa Maumere have not yet optimally utilized the potential of these local materials in the learning process. Arts and Crafts (*Seni Budaya dan Prakarya/SBdP*), which has now been transformed into the *Project for Strengthening the Profile of Pancasila Students (Proyek Penguatan Profil Pelajar Pancasila/P5)* under the *Merdeka Curriculum*, still tends to rely on manufactured materials purchased from stores, such as colored paper, plastic packaging, and other synthetic materials. Dependence on external materials not only places an additional financial burden on students' parents but also distances students from the ecological and cultural realities of their own environment. There is a clear disconnect between what students learn in the classroom and the environmental dynamics outside the school. Students are often unaware that waste accumulating around their communities can actually be converted into highly valuable learning media.

Creativity among elementary school-aged children requires stimulation that is concrete, tactile, and contextual. Through activities involving the manipulation of physical materials, students can develop sensory acuity, fine motor coordination, and problem-solving abilities. When confronted with Maumere woven fabric scraps featuring diverse geometric motifs, contrasting colors, and distinctive textures, students' spatial and aesthetic imagination is challenged to reconstruct these random pieces into a new, complete, and functional work. This reconstruction process requires flexible thinking (*flexibility*), originality of ideas (*originality*), and persistence in elaborating object details (*elaboration*). Therefore, recycling fabric scraps has considerably richer pedagogical value than simply copying or coloring pre-existing patterns.

In addition to creativity, the affective dimension of environmental awareness character is a key concern of this study. Environmental awareness character cannot be developed solely through memorizing texts or receiving moral lectures in the classroom. It requires habituation arising from direct experience (*experiential learning*). When students participate in real actions to collect, sort, and process woven fabric scraps found in their surroundings, they develop critical awareness (*critical consciousness*) of waste-related problems. They learn to understand the causal relationships among human consumption, waste production, and ecosystem sustainability. The psychological transformation from a "passive consumer" into a "green change agent" at the elementary school level represents an essential achievement of environmental education (*eco-education*).

Previous studies have extensively explored the use of plastic waste, paper, and used bottles in elementary school learning to improve children's motor skills. However, research specifically integrating traditional ethnic textile waste—such as Maumere ikat fabric scraps—as a dual-purpose instrument for stimulating creativity while simultaneously internalizing environmental awareness character remains very limited. Most studies concerning Maumere weaving have focused on anthropology, cultural studies, or macroeconomic issues related to the welfare of artisans. A significant literature gap therefore exists in positioning ethnic weaving waste as a formal ecological education medium in elementary schools.

Based on this complex background, this study was conducted to empirically and methodologically examine the effectiveness of a Maumere woven fabric scrap recycling program at SDK Bhaktiarsa Maumere. Through a structured quasi-experimental approach, this study is expected to contribute scientifically in the form of an ecological arts learning model based on local wisdom (*ethno-eco-art education*). The results are intended not only to address theoretical and academic needs but also to provide practical solutions for elementary school educators in designing innovative, affordable learning activities that generate positive ecological impacts and are strongly rooted in local culture.

RESEARCH METHOD

Research Design

This study employed a quantitative approach using a quasi-experimental method. The experimental design applied was a *One-Group Pretest-Posttest Design*. Through this design, the effect of the independent variable (the Maumere woven fabric scrap recycling program) on the dependent variables (creativity and environmental awareness character) was measured by comparing the condition of the subjects before the treatment and after the treatment was completed. The initial measurement (*pretest*) enabled the researchers to establish an accurate baseline, allowing changes in the final measurement (*posttest*) scores to be statistically attributed to the intervention while minimizing external bias.

Population and Sample

The population of this study consisted of all upper-grade students at SDK Bhaktiarsa Maumere, Sikka Regency, East Nusa Tenggara. The sample was determined using *purposive sampling*, namely a sampling technique in which participants are selected based on specific considerations or criteria established by the researcher to ensure intervention effectiveness. The criteria included: (1) students were in the final stage of the concrete operational phase (Grade V), in which fine motor skills and environmental moral reasoning had begun to mature; (2) the class had a flexible schedule for arts project-based learning;

and (3) students had not previously received formal training in textile waste recycling. Based on these criteria, Grade V was selected, with a total sample of 35 students (18 male students and 17 female students) serving as the single experimental group.

Intervention Implementation Procedure

The study was conducted in three main stages implemented sequentially over a two-month period, as follows:

1. Pre-Experimental Stage (*Pretest*)

At the initial stage, the researchers conducted baseline measurements of the two dependent variables. For the creativity variable, students were asked to create free-form handicrafts using paper without specific instructions regarding recycling. The products were then assessed using a creativity rubric. For the environmental awareness character variable, students completed an ecological behavior questionnaire guided orally by the researchers to ensure their understanding of each item. This was supported by a daily behavioral observation sheet completed by the classroom teacher.

2. Intervention Stage (*Treatment*)

The intervention was implemented through the "Sikka Green Crafter" Workshop Program, consisting of four structured sessions. Each session lasted three lesson periods (3×35 minutes), as follows:

- **Session 1 (*Eco-Literacy & Sorting*):** Students received education about the textile waste crisis in Maumere and the cultural value of Sikka ikat weaving. Students were then guided to sort woven fabric scraps according to size, color, and geometric motifs.
- **Session 2 (*Basic Skills & Upcycling*):** Students were trained in basic techniques for cutting, gluing, and combining woven fabric scraps on a rigid base to create simple products, including ethnic bookmarks and decorative clothing brooches.
- **Session 3 (*Advanced Crafting*):** Students independently designed and produced functional items with a higher level of difficulty, such as decorating plain mini tote bags and creating diary covers using woven fabric scraps.
- **Session 4 (*Exhibition & Reflection*):** Students presented their work in front of the class, explained the philosophy behind the weaving motifs they selected, and reflected on their actual contributions to reducing waste in Maumere.

3. Post-Experimental Stage (*Posttest*)

After the entire intervention series had been completed, a final measurement was conducted. Students' creativity was assessed based on the final products created during Session 3 using the same rubric as that used in the *pretest*. Environmental awareness character was measured again using the questionnaire and a final observation sheet to determine whether there had been sustained behavioral changes among the students.

Data Collection Instruments

The research data were collected using two main instruments whose validity and reliability had been tested:

- **Creative Product Assessment Rubric (Score 1–100):** This instrument was adapted from Torrance's theory of creativity and measured four main indicators:

1. **Fluency:** The ability to generate multiple ideas or decorative elements within a single product.
 2. **Flexibility:** The ability to combine various woven motifs (e.g., *Moko*, *Sura*, or *Wela* motifs) with supporting materials harmoniously.
 3. **Originality:** The uniqueness of the resulting product, rather than merely imitating the work of a classmate.
 4. **Elaboration:** The level of precision, neatness of gluing, harmony of the pieces, and quality of the product's finishing.
- **Environmental Awareness Character Scale Questionnaire (Likert Scale 1–4):** This instrument consisted of 20 positive and negative statements measuring students' affective and conative dimensions. The questionnaire indicators included awareness of disposing of waste properly, habits of reducing paper and plastic use at school, concern for classroom cleanliness, and enthusiasm for utilizing used materials. This measurement was supported by a Behavioral Observation Sheet to record students' actual actions while in the school environment, such as picking up scattered waste without being instructed.

Data Analysis Techniques

All quantitative data obtained from the *pretest* and *posttest* were processed using IBM SPSS Statistics. The data analysis procedures included:

1. **Analysis Prerequisite Test:** Before testing the hypotheses, a normality test was conducted to determine the appropriate statistical procedure. Given that the sample consisted of 35 students ($N < 50$), the *Shapiro-Wilk* normality test was employed. If the significance value (p) was greater than 0.05, the data distribution was considered normal.
2. **Hypothesis Testing:** After the data were confirmed to be normally distributed, hypothesis testing was conducted using the parametric *Paired-Samples t-Test*. This test was used to determine whether there was a statistically significant difference between the mean *pretest* and *posttest* scores. The decision criterion was based on the two-tailed significance value at a significance level of 5% ($\alpha = 0.05$). If $p < 0.05$, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_a) was accepted, indicating that the Maumere woven fabric scrap recycling program was significantly effective in developing students' creativity and environmental awareness character.
3. **Descriptive Analysis and N-Gain:** To determine the magnitude of effectiveness or absolute improvement, mean scores, percentage increases in achievement, and categorization of creativity quality and environmental awareness character were calculated based on established assessment criteria.

RESULTS AND DISCUSSION

Results of the Analysis Prerequisite Test (Normality)

Before conducting the comparative test, the distribution of the data was tested for normality. Based on the *Shapiro-Wilk* test, the significance values for the creativity variable were 0.234 for the *pretest* and 0.189 for the *posttest*. Meanwhile, for the environmental awareness character variable, the significance

values were 0.112 for the *pretest* and 0.341 for the *posttest*. Since all *p*-values were greater than 0.05, it can be concluded that the data for both variables were normally distributed and met the requirements for analysis using the parametric *Paired-Samples t-Test*.

Improvement in Students' Creativity Scores

The effectiveness of the intervention on students' creativity was measured by comparing scores from the handicraft product assessment rubric before and after the intervention. Detailed data on the development of students' creative performance are presented in Table 1.

Table 1. Distribution of Students' Creativity Indicator Scores (N = 35)

No.	Creativity Assessment Aspect (Torrance Indicator)	Mean Pretest Score	Pretest Category	Mean Posttest Score	Posttest Category	Improvement
1	Idea Fluency (<i>Fluency</i>)	64.50	Fair	86.00	Very Creative	+21.50
2	Thinking Flexibility (<i>Flexibility</i>)	60.00	Fair	82.50	Very Creative	+22.50
3	Originality of Ideas (<i>Originality</i>)	58.00	Poor	81.00	Creative	+23.00
4	Detail Elaboration (<i>Elaboration</i>)	67.10	Fair	87.10	Very Creative	+20.00
–	Overall Cumulative Mean	62.40	Fair	84.15	Very Creative	+21.75

The data in Table 1 confirm a consistent improvement in creative performance across all determining indicators. The *originality* indicator recorded the highest increase, at +23.00 points. At the initial stage, students tended to be passive and merely imitate standard patterns without modification. However, after being given the freedom to explore Maumere woven fabric scraps, students were able to generate authentic ideas, such as arranging fabric scraps into the silhouette of a traditional Sikka house (*Lepo Gete*) or combining them to create three-dimensional bookmarks. The *elaboration* indicator achieved the highest final score of 87.10, reflecting the considerable development in children's precision, patience, and fine motor skills during the physical manipulation of fabric scraps.

Improvement in Environmental Awareness Character

Changes in students' affective dimensions, measured using a Likert-scale questionnaire and validated through daily observation sheets, also showed a positive trend. Before the program was implemented, the students' environmental awareness character index was 58.50%, which fell into the *Beginning to Develop (BD)* category. This condition was characterized by students' tendency to ignore candy wrappers under their desks and dispose of used writing paper carelessly in the classroom.

After participating intensively in the recycling intervention, the environmental awareness character index increased to 81.20%, categorized as *Cultivated/Consistently Demonstrated (CD)*. This transformation was reflected in actual behavior in the field: students proactively collected pencil shavings, organized waste-sorting bins in the classroom, and independently utilized leftover external fabric scraps as decorations for their school equipment without teacher instruction.

Inferential Analysis (Hypothesis Testing)

To determine whether the increase in the mean scores was statistically significant rather than merely a result of chance, statistical analysis was conducted using the *Paired-Samples t-Test*. The computer-generated results are presented in Table 2.

Table 2. Results of the Paired-Samples t-Test

Test Variable	Mean Difference	Standard Deviation	Calculated <i>t</i>	Degrees of Freedom (<i>df</i>)	Sig. (2-tailed) / <i>p</i> -value	Conclusion
Creativity (<i>Pre</i> vs. <i>Post</i>)	-21.750	3.142	-12.431	34	< 0.001	H _a Accepted (Significant)
Environmental Awareness (<i>Pre</i> vs. <i>Post</i>)	-22.700	4.015	-10.892	34	< 0.001	H _a Accepted (Significant)

Based on the statistical output in Table 2, the two-tailed significance values for both variables were $p < 0.001$. Since the significance values were substantially lower than the predetermined error level ($\alpha = 0.05$), the null hypothesis (H_0) was rejected and the alternative hypothesis (H_a) was accepted. The negative calculated *t*-values (-12.431 and -10.892) mathematically indicate that the *posttest* scores were consistently and significantly higher than the *pretest* scores. Therefore, it can scientifically be stated that the Maumere woven fabric scrap recycling learning program was effective in increasing product creativity and developing environmental awareness character among students at SDK Bhaktiarsa Maumere.

Experimental Discussion

The success of the Maumere woven fabric scrap recycling program in enhancing students' creativity and affective development can be explained through several contemporary pedagogical theories. First, activities involving the handling of fabric waste stimulated children through an *Experiential Learning* approach, which emphasizes direct learning experiences and is associated with the educational philosophy of John Dewey. Elementary school children aged 7–12 are in the concrete operational stage of cognitive development according to Jean Piaget. At this stage, children cannot fully comprehend abstract concepts such as "creativity" or "environmental sustainability" merely through verbal instruction. When students directly touch the coarse threads of Maumere woven fabric, precisely cut its patterns, and match the contrasting colors of Sikka ethnic motifs, all of their senses become involved in constructing new understanding. This sensory-motor experience naturally stimulates the acceleration of children's creativity.

Second, the use of local Maumere woven fabric scraps serves as a strong cultural bridge (*cultural-contextual scaffolding*). Maumere ikat motifs are rich in geometric patterns and representations of local

flora and marine fauna that are familiar in students' daily lives. This visual familiarity reduces children's psychological barriers to creative expression (*art anxiety*). Unlike modern manufactured materials that are relatively detached from local values, woven fabric scraps evoke a *sense of place* and *cultural pride*. Creativity showed a sharp increase in the *originality* aspect because students felt emotionally connected to the materials they used, encouraging them to express Sikka's cultural identity through modern and functional handicrafts.

Third, the internalization of environmental awareness character occurred through a process of deconstructing and reconstructing the perceived value of waste materials. In the urban environment of Maumere, leftover fabric from garment production or weaving is generally regarded as valueless residue that detracts from the city's aesthetic quality and is often eliminated through burning. Through this intervention, students' perceptions were transformed through the concept of *eco-literacy*. Students directly observed how discarded fabric pieces that were initially considered dirty and useless could, through creative intervention, be transformed into aesthetically appealing brooches with economic value or wall decorations that enhanced the classroom environment. The experience of converting waste into valuable products (*upcycling*) fostered a sense of ecological responsibility. Students began to understand that small actions involving the reuse of waste could constitute a practical solution to the broader environmental problems faced by their community in Sikka Regency.

Overall, the integration of zero-waste-based ethnic handicrafts in this study demonstrates that character education does not have to come at the expense of children's practical skill development. This integrated learning model successfully achieved two educational outcomes: producing works that demonstrated enhanced motor-spatial intelligence (creativity) while simultaneously strengthening positive moral dispositions toward environmental sustainability (environmental awareness). This finding is consistent with the direction of the *Merdeka Curriculum*, which emphasizes contextual learning rooted in local wisdom to address global environmental challenges.

CONCLUSION

Based on the empirical data analysis, inferential statistical testing, and discussion presented above, this study concludes that the Maumere woven fabric scrap recycling program was significantly effective in developing creativity and environmental awareness character among students at SDK Bhaktiarsa Maumere. The improvement in students' creative performance was demonstrated by an increase in the overall mean score from the *Fair* category (62.40) to the *Very Creative* category (84.15), with the highest increase occurring in the *originality* indicator. Similarly, students' environmental awareness character experienced substantial strengthening, increasing from the *Beginning to Develop* level (58.50%) to the *Cultivated/Consistently Demonstrated* level (81.20%), as reflected in observable changes in students' daily behavior in maintaining the cleanliness and sustainability of the school environment.

The success of this intervention confirms that traditional ethnic textile waste should no longer be viewed solely as a source of environmental pollution but can instead be transformed into an affordable, aesthetically valuable, and educationally meaningful contextual learning medium. The practical implication of this study is that educators and policymakers in elementary schools, particularly in East Nusa Tenggara, should consider integrating this *upcycling*-based craft learning model using local waste materials into the structure of the arts and culture curriculum as well as co-curricular projects such as the *Project for*

Strengthening the Profile of Pancasila Students (P5). This strategic approach can contribute to developing a younger generation that is not only motorically skilled and imaginative but also possesses strong ecological literacy and a deep sense of pride in their regional cultural heritage.

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