



ECOLIMBAH : Cross-Ecosystem Pollution Reduction through Creative Craft Business with Commercial Value

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Abstract: This community service program aims to provide knowledge and skills to the community on how to manage and process household waste, especially plastic, into valuable and marketable products. The methods for implementing community service activities included lectures, practical exercises, and guidance. The evaluation used in the community service activities involved the utilization of questionnaires and their subsequent qualitative descriptive analysis. The outcome of the community service activities was an increase in knowledge about waste bank management and skills in utilizing plastic waste to create woven plastic bags for water bottle holders. In conclusion, community service has proven to be a highly effective endeavor, providing valuable knowledge and skills to the partners while promoting environmental awareness and sustainability through plastic crochet.

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Introduction

Environmental cleanliness is one of the benchmarks for the quality of life in society (Buhungo, 2012). The current environmental condition shows significant changes compared to several decades ago (Rahmayanti et al., 2022) (Kodi Rina Mariani Gobai, Batara Surya, 2020). One aspect contributing to environmental degradation is the accumulation of waste in the air, water, and soil, which can disrupt various ecosystems (Ayuningtias, 2019). Waste can disturb the environmental balance, such as water pollution, climate change, air pollution, and soil contamination (Indrawati, 2011). It not only damages environmental sustainability but also affects public health. Pollution through air, water, soil, and other organisms can lead to diseases (Hasibuan, 2016).

Plastic waste is one of the wastes that have a wide impact on environmental changes (Diki et al., 2019). It affects the environment and health, as it can cause cancer and tissue damage in the human body (Kanuriesturi, 2013). In Indonesia, around 3.2 million tons of plastic are consumed annually, and 1.2 million tons of waste are dumped into the sea (Paramarta et al., 2022). Plastic bags are the most commonly used type of plastic waste (Paramarta & Panindias, 2022).

Gunungpati District is among the top 10 districts contributing to the amount of waste accumulation in Semarang City, with 180.94 m³/day, and the largest source of waste comes from residential or household areas (Chotimah, 2015). Despite having several waste management education programs, Gunungpati still ranks among the top ten contributors to the largest waste in Semarang, with waste generation reaching 205.59 m³/day, dominated mainly by domestic household waste, with an average of 15.01 liters/day (Kusumaningtyas et



al., 2022). The Head of the Environmental Agency of Semarang City stated that Semarang City holds significant potential for environmental damage due to waste. The waste produced from household waste in Gunungpati will cause cross-ecosystem damage to water, soil, and air.

Based on an interview with Mrs. Ita Setiyaningsih (the head of Gunungpati sub-district) on March 2, 2022, she mentioned, "So far, there have been several education activities about the impacts conducted by college students (KKN), the government department, and community service programs, but there has been none that teach how to knit plastic. Regarding household waste, most of the waste generated is plastic waste, and besides, the community is still confused about how to sort the waste properly." The interview results are further supported by the preliminary survey using a Google form distributed to 20 residents, indicating that 41% of the community has a limited understanding, 37% have a moderate understanding, and 22% have a good understanding of these two types of waste.

Due to the lack of understanding among the community regarding the differentiation between organic and inorganic waste, both types of waste are often disposed of together without being separated first. This practice has led to significant environmental challenges as these mixed wastes contribute to pollution and degradation of natural ecosystems. Proper waste separation is crucial for environmental stability and sustainability, as it allows for more efficient recycling, composting, and disposal processes.

Among the various types of waste, inorganic waste, mainly plastic, poses a significant environmental threat. Plastics are non-biodegradable materials, which means they do not decompose naturally over time. Plastic bags and plastic-made items, for instance, may take hundreds or even thousands of years to degrade (Rahmi & Selvi, 2021) (Gunadi, et al., 2021) (Utami & Fitria, 2020). As a result, plastic waste accumulates in landfills, pollutes water bodies, and contaminates soil, posing severe risks to wildlife and marine ecosystems (Wahyudin & Afriansyah, 2020). Comprehensive waste management strategies must be implemented to address this pressing issue. These strategies include waste reduction initiatives, improvement in waste collection and processing systems, waste composition analysis to identify potential recycling opportunities, promoting mass production of environmentally friendly products, and formulating policies targeting plastic waste prevention and effective handling.

In the context of Gunungpati Sub-district, where waste management is a critical concern, specific actions must be taken to alleviate the adverse impacts of waste. One such action is focusing on waste handling through producing environmentally friendly products using plastic waste derived from household waste. This approach encourages creativity and entrepreneurship within the community as innovative solutions are sought to transform plastic waste into marketable items, contributing to waste reduction and environmental conservation efforts. Engaging the community in waste management practices and raising awareness about the importance of waste separation will be essential. Educational programs and campaigns can be organized to teach residents about the significance of separating organic and inorganic waste and the potential benefits of recycling and upcycling initiatives.

Additionally, collaboration between local government, NGOs, and private sectors can play a crucial role in developing sustainable waste management systems. By pooling resources and expertise, various stakeholders can work together to establish waste processing facilities, recycling centers, and workshops to create environmentally friendly plastic waste products. In conclusion, proper waste separation and effective waste management are vital to ensure environmental health and sustainability. By educating the community, fostering



innovation, and implementing practical strategies, Gunungpati Sub-district can take significant steps towards reducing the adverse impacts of waste and safeguarding the environment for current and future generations.

Method

The implementation of community service activities was technically divided into several stages: first, the preparation stage was carried out to develop the activity schedule with partners, prepare training materials, and identify the needs for program implementation. Second, the execution of the community service activities involved all solutions designed by the community service team and the partners. Based on mapping priority issues and proposed solutions, the community service team prepared an implementation plan for the program within an eight-month timeframe. The implementation of the community service program used an approach and stages in applying technology to the partner community, which can be detailed in Table 1.

Table 1. The Implementation of the Community Service Program

No	Programs	Description
1	Need Analysis	Needs Analysis/Identification Gunungpati is among the top 10 districts contributing to the amount of waste accumulation in Semarang City, with an average daily waste production of 205.59 m ³ . The level of waste management understanding among the residents in Gunungpati showed that 41% had poor understanding, 37% had moderate understanding, and the rest had good understanding. It is identifying the weaknesses and strengths of the community service partners. The weaknesses include inadequate waste management practices and a low response to the potential of transforming waste into functional products with commercial and utility value. The strengths of the community service partners include the availability of significant unused plastic waste and a considerable number of housewives, offering the possibility for empowerment and training to transform plastic waste into crafts.
2	Design	a. Design Identification of needs: suboptimal waste management, ineffective waste banks, low public understanding of managing organic and non-organic waste, and low response to transforming waste into functional products with commercial and utility value. b. Problem formulation: identifying human resources skills in waste management, including waste separation and skills to transform waste into products with commercial and utility value. c. Synthesis: at this stage, the community service team designs the service plan according to the partners' needs. d. Analysis: Several waste management strategies are identified for their weaknesses and strengths, and they will be selected according to the partners' needs and capabilities. e. Evaluation: the results of Synthesis and analysis are evaluated according to established standards.
3	Development	Development Subsequently, training related to waste separation and crafting from plastic waste will be conducted, tailored to the partners' needs.
4	Operational Assistance	The program will use presentation or material exposition methods, followed by question-and-answer sessions, discussions, and direct practice.
5	Implementation	The training will be carried out by providing materials and direct application of skills to the community service partners.

Lastly, monitoring and evaluation were conducted continuously to assess behavioral changes before and after implementing community service. The evaluation was performed by



distributing questionnaires to measure the partners' level of understanding in receiving the materials and skills provided by the community service team. The provided questionnaires were then analyzed descriptively and qualitatively. The monitoring was carried out through post-service observations using a checklist that aligns with the specifications and success standards designed by the community service team. Through these ongoing monitoring and evaluation processes, the community service team aims to gather valuable feedback and data on the effectiveness of their initiatives. They can assess the impact of the training and waste management activities on the partner community's behavior and knowledge. This information will help the team make informed decisions and adjustments to improve the program's outcomes further and ensure its sustainability. By continuously monitoring and evaluating the program, the community service team can measure its success in achieving the desired goals and objectives. It also allows them to identify areas of improvement and implement necessary changes to meet the partner community's needs in Gunungpati. The ultimate goal is to foster positive and lasting changes in waste management practices and empower the community to continue practicing environmentally friendly habits beyond the duration of the community service program.

Result and Discussion

The community service program commenced with an opening session led by the community service team from Universitas Negeri Semarang. Subsequently, the team conducted a socialization session on managing household waste, mainly plastic waste that cannot decompose naturally in the soil. It was followed by a training session on processing plastic bag waste into useful products using crochet techniques. The first activity during the community service program was a crucial socialization session held in Muntal Village, Gunungpati. The primary objective of this session was to create awareness and educate the local community about waste management practices, specifically focusing on the management of plastic waste, particularly plastic bags that are not biodegradable.

The socialization session began with an opening speech by the community service team from Universitas Negeri Semarang. They introduced themselves, explained the program's purpose, and expressed their commitment to assisting the community in improving waste management practices. The main topics covered in the socialization session were: (1) Introduction to Waste Banks: The community service team explained the concept and benefits of waste banks. Waste banks are community-based initiatives that encourage the proper separation and recycling of waste. The participants were informed about the advantages of waste banks in promoting waste reduction, resource efficiency, and environmental sustainability; (2) Waste Separation: The community service team emphasized the importance of separating organic and inorganic waste at the source. They explained that separating waste into organic (biodegradable) and inorganic (non-biodegradable) categories is essential for effective waste management and recycling efforts; (3) Household Waste Management: The participants were educated on best practices for managing household waste. The team provided practical tips and guidelines on segregating and storing waste properly, as well as the significance of minimizing single-use plastic items to reduce plastic waste generation; (4) Challenges of Plastic Waste: Special attention was given to plastic waste, especially plastic bags. The team highlighted the environmental impact of plastic waste that cannot easily decompose naturally, leading to pollution of land and water bodies and posing a threat to wildlife and human health; (5) The socialization session was interactive, allowing participants to ask questions and share their experiences and concerns



related to waste management. The team provided informative materials, brochures, and visual aids to support learning. By conducting this socialization activity, the community service team aims to raise awareness, improve knowledge, and instill a sense of responsibility among the local community regarding proper waste management practices. Empowering the community with such knowledge is a crucial step towards creating a more sustainable environment in Muntal Village and fostering a culture of responsible waste management among its residents.

The next activity was training on processing plastic bag waste using crochet techniques. Through plastic weaving, participants will be taught practical methods to transform plastic bag waste into useful products. One of the products that will be learned and created during the training is a plastic woven bag suitable for holding water bottles or glasses. In this training, participants will be given step-by-step guidance in the process of plastic weaving, starting from preparing the materials and cutting the plastic bags to the proper crochet technique techniques. The community service team provided simple yet functional examples of designs and models for plastic woven bags.

Twenty participants were able to practice and experience crochet techniques hands-on, guided by the community service team. Each step was closely monitored to ensure participants mastered the method effectively. Apart from technical skills, the training also emphasized the importance of reducing the use of single-use plastic bags and efforts to recycle plastic waste. Participants were encouraged to understand the negative impact of plastic waste on the environment and the importance of actively contributing to plastic waste reduction.

The first activity in the plastic crochet technique was creating plastic strips that resemble threads. Participants would be given guidance and assistance on cutting plastic bags to transform them into long thread-like strips. During this activity, the community service team would demonstrate how to cut and prepare plastic bags properly. They showed the participants how to cut the bags into thin, uniform strips resembling long threads. This process is crucial as it lays the foundation for the crochet technique that will be used to create various products. The participants would then be encouraged to practice cutting the plastic bags under the supervision and guidance of the team. The team would ensure participants master the technique and produce the desired thin strips with a consistent width. This initial step of preparing plastic strips is essential in the plastic crochet technique process as it determines the quality and uniformity of the finished woven products. By providing hands-on guidance and assistance, the community service team aims to equip the participants with the necessary skills to transform plastic waste into valuable woven items.



Figure 1. Practicing the Technique of Cutting Plastic Bags



The second activity involved training the participants to use a specialized crochet hook tool to start the crochet technique. Before they began weaving, the participants would receive an explanation of how to hold the crochet hook properly. They would be guided by the community service team in the crochet technique process. The participants would be taught several crochet technique techniques, including the Chain (CH) technique, Single Crochet (SC), Half Double Crochet (HDC), and Double Crochet (DC).



Figure 2. The Plastic Bags that have been Transformed Into Long Thread-Like Strips Resembling Yarn Will then Undergo The Crochet technique Process

During that training, the community service team demonstrated how to use the crochet hook tool and showcased each crochet technique. The team explained the step-by-step process of creating stitches and patterns using the plastic strips prepared earlier. The team ensured the participants understood the techniques and followed the instructions correctly. Once the participants became familiar with the basic crochet techniques, they were encouraged to practice the various stitches under the guidance of the community service team. The team provided hands-on support and feedback to help participants improve their crochet technique skills.



Figure 3. The woven plastic bag products from the community service participants' creations

This training equips the participants with practical skills, fosters creativity, and encourages them to explore various crochet technique patterns. Through this hands-on experience, the participants will gain a sense of accomplishment in transforming plastic waste into functional and aesthetically pleasing products, contributing to waste reduction and promoting environmental sustainability. At the end of the training, participants are expected to produce high-quality plastic woven bags and be able to utilize them in their daily lives. Additionally, it is hoped that the training will inspire and equip participants with the skills to further explore their creativity in transforming plastic waste into other valuable products. Through this training, it is anticipated that the community in Muntal Village will reduce the use of single-use plastic bags and become more environmentally conscious in managing



plastic waste. Thus, this community service program creates a cleaner, healthier, and more sustainable environment.

After implementing the community service activities, the final step is to evaluate to measure the effectiveness of the service program. This evaluation was carried out by providing questionnaires to the partners or beneficiaries of the program. The questionnaires are designed to gather feedback and insights from the partners regarding various aspects of the community service program. They may include questions about the relevance and impact of the activities, the usefulness of the skills and knowledge acquired, the satisfaction level with the training sessions, and any suggestions for improvement. The evaluation process is crucial as it allows the community service team to assess the program's success and identify areas that need further enhancement or adjustments. The feedback from the partners will serve as valuable input for future community service initiatives and help continuously improve the quality and effectiveness of the outreach programs. By conducting this evaluation, the community service team ensures that the efforts put into the program yield meaningful results and that the goals of empowering and benefiting the community are achieved. The insights gained from the evaluation also foster a reflective and responsive approach to community engagement, promoting sustainable and impactful development in the areas served by the community service initiatives. The questionnaire results can be seen in table 2.

Table 2. The Results of the Community Service Activities Evaluation

No	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1	The material presented in Community Service was interesting to study	72%	28%	0	0
2	The relationship between the material presented and the needs of the community service partners	69%	31%	0	0
3	The speakers had the competence that matches the community service material	85%	15%	0	0
4	The techniques used in the community service activities were in line with the community service material	51%	49%	0	0
5	The time used was in accordance with the planned allocation	9%	66%	25%	0
6	The material was presented clearly and easy to understand	35%	63%	2%	0
7	The partners directly benefited from the implemented community service activities	44%	55%	1%	0
8	The community service activities successfully increased the knowledge and skills of the partners	26%	74%	0	0
9	The partners were satisfied with the implemented community service activities	70%	29%	1%	0

The evaluation results of the community service activities provide valuable insights into the satisfaction and perception of the partners regarding various aspects of the program. The fact that 72% of the partners strongly agree that the presented material is interesting indicates that the community service team successfully delivered engaging and relevant



content. The material must have captured the participants' attention and sparked their curiosity, making the learning experience enjoyable and beneficial. The response from 69% of the partners, who stated that the taught material aligns with their specific needs, signifies that the community service team thoroughly assessed the partners' requirements and tailored the content accordingly. This alignment demonstrates the effectiveness of the needs assessment process in ensuring that the program addresses the community's specific challenges and issues.

The high % approval rating of 85% for the speakers' competence indicates that the community service team comprised knowledgeable and skilled individuals. Their expertise in the subject matter likely contributed to the successful delivery of the program and the effective transfer of knowledge to the partners. Regarding the statement about the adequacy of the allocated time for community service activities, the feedback from 25% of the partners expressing disagreement highlights a significant aspect to consider for future improvements. The partners' perspective on time allocation is crucial as it reflects their perceived skill development and practice needs. The community service team needs to consider this feedback and reassess the time allocation to ensure sufficient time is dedicated to skill-building activities like plastic weaving.

In conclusion, the evaluation results demonstrate the community service activities' overall effectiveness and positive impact on the partners. The high satisfaction rates regarding the speakers' material, relevance, and competence are encouraging signs of a successful program. Additionally, the feedback regarding the time allocation provides valuable input for continuous improvement and better tailoring of future community service initiatives to meet the specific needs and expectations of the partners. The evaluation results show the positive impact of our community service activities on partners, with high satisfaction rates. Feedback on time allocation will guide future improvements. We plan to maintain monitoring, empower partners, strengthen partnerships, and advocate for sustainability.

Conclusion

The conducted community service activities yielded several noteworthy conclusions. Firstly, the program successfully engaged the participants, as evidenced by their positive responses to the presented material. An impressive 72% of the participants strongly agreed that the material was interesting. The community service team adeptly selected relevant topics and utilized effective delivery methods, capturing the participants' attention and curiosity. Secondly, the program's effectiveness was further enhanced by its alignment with the partners' specific needs. A significant percentage of 69% of the participants reported that the taught material was relevant and addressed their unique challenges. It showcases the community service team's thoughtful and customized approach, tailoring the content to cater to the partners' requirements, resulting in a more meaningful and impactful learning experience.

Thirdly, the high approval rating of 85% for the speakers' competence is a testament to the expertise and proficiency of the community service team. The presence of knowledgeable and skilled speakers significantly contributed to the successful transfer of knowledge and enriched the participants' learning journey. Lastly, the feedback from 25% of the participants expressing disagreement regarding the time allocation for the activities highlights the importance of evaluating and reevaluating the duration of future programs. The community service team should carefully assess the complexity of specific skills, like plastic



crochet, to ensure adequate time allocation for comprehensive skill development. In conclusion, community service has proven to be a highly effective endeavor, providing valuable knowledge and skills to the partners while promoting environmental awareness and sustainability through plastic crochet. The overwhelmingly positive feedback and overall satisfaction expressed by the participants underscore the program's success in achieving its intended goals and fostering a positive impact on the community.

Recommendation

It is essential to evaluate the duration of each activity in the program carefully. Adequate time should be allocated, especially for skill development activities like plastic crochet, to allow participants to grasp new concepts and practice their skills thoroughly. Furthermore, promoting the active participation of the partners in the planning and implementation of activities will foster a sense of ownership and collaboration. Involving them in identifying relevant issues and potential solutions will make the program more relevant and impactful. A sustainable monitoring and evaluation system should be integrated to track the long-term impact of the community service program. By regularly evaluating the program's outcomes, strengths, and areas for improvement, adjustments can be made to ensure continuous growth and effectiveness. Finally, exploring opportunities to expand the program's impact by collaborating with various stakeholders, including government agencies, community organizations, and educational institutions, will lead to a broader reach and more significant contributions to the community's well-being. By embracing these recommendations, the community service program will evolve into a more robust and impactful initiative, positively impacting the lives of the partners and the community.

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