Education of Waste Management Based on Zero Waste in Kendal District (Case Study: Waste Recycling Craft Community (Kerdus), Kendal District, Central Java)

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Abstract. Garbage is a global problem that should be handled properly from the source to cut off the flow of waste. Therefore, it is necessary to educate the public about the importance of protecting the biosphere from waste and the application of an environmentally friendly lifestyle. The focus of this research is on the KerDUS Community of Kendal Regency as a community of environmental care volunteers who educate plastics, the environment, and ecobricks, as well as environmentally friendly lifestyles. This research is qualitative phenomenological research that reflects the activities of the KerDUS Community as a community that has succeeded in educating the people of Kendal Regency and its surroundings in reducing waste. Data comes from primary and secondary sources collected from interviews, participatory observation, documentation, and questionnaires. The results showed 76% of the training participants had implemented the 3R (Reduce, Reuse, and Recycle) in their daily life both at home and outside the home. Offline workshop with snacks from environmentally friendly food and bring your own tumbler as a drinking place. Many participants have locked their plastic in an ecobrick to make it an environmentally friendly product that can be assembled and assembled.

1. Introduction

The environment as a place to live must be preserved and clean. The environment that is damaged or polluted will cause natural disasters such as floods that disturb the lives of living things. One of the causes of flooding the blockage of waterways due to the accumulation of garbage such as plastic. The nature of plastic which is light, strong, durable, attractive, elastic, cheap, and easy to obtain, is widely used as a wrap, household appliances, or furniture. If plastic is not used wisely, it will cause piles of plastic waste to fill trash bins, roads and even in the ocean there is also plastic waste such as food and beverage packaging. Throughout 2018 food and beverage packaging was the second-largest garbage collected in the ocean [1]. This plastic waste comes from household waste carried by the flow of water into the sea.

Household waste is the residue from household activities that are no longer used. Household waste is mostly in the form of organic waste and inorganic waste. Organic waste has the largest composition at 70% followed by inorganic waste at 28%, and B3 waste which is only 2% [2]. In general, there are 3 types of organic waste, namely food waste, vegetable and fruit scraps, or kitchen waste and rubbish from sweeping the home page. There are various types of inorganic waste, namely paper, plastic, iron,
Some of the waste is sold rubble (iron and glass), but some are of no value and must be disposed of as trash. Indonesia's population of around 250 million people turns out to be able to produce household waste of 151,192 tons per day with the habit of littering as much as 70.31% [3].

The slogan of disposing of garbage in its proper place should not be quite right, because the garbage that is thrown into the trash, will eventually collect in the final disposal site (TPA). Garbage at the TPA will be burned or piled up which causes pollution and leachate contamination. The more dominant factors that cause obstacles in waste management are a lack of knowledge, about waste management, poor waste management habits, and a lack of community participation in waste management [4]. So the main problem in handling waste is the lack of public knowledge about the use of waste and the low willingness of the community to process waste into a valuable product because people still think that waste is dirty and unhealthy [5].

The landfill is only used as a landfill and cannot get rid of the existing waste, so the amount of garbage collected increases and piles up like a mountain of garbage. In the TPA, the garbage will be mixed and burned, which causes pollution and odor. So that residents whose areas are used as TPA protested the impact of the TPA's existence. There was a pollution protest so that residents blocked the garbage truck from entering the Darupono TPA, Kendal. The garbage truck was asked not to unload the garbage at the TPA Darupono because it was full and worried that the stench would spread, even though the Kendal Regency Government had closed the Pagergunung TPA, which residents also protested [6]. Therefore, it is necessary to handle and manage waste wisely starting from the source [7]. If everyone is responsible for the existence of waste by reducing the use of plastic which contributes to producing waste, processing, or reusing plastic, it will reduce the accumulation of waste in landfills [8].

One form of concern for waste by implementing 3R, Reduce, Reuse, and Recycle, as well as technology and proper waste management for the sustainability of life. This problem can be addressed by following the 3 R's; reduce, reuse, and recycle. Japan is continually aiming towards becoming a sustainable, recycling-oriented society with the implementation of the 3 R's, reducing GHG emissions, and innovating new technologies for recycling and waste management. What Japan has done is a way to sustain life for the creation of a balanced earth ecosystem, namely by implementing the 3R, reducing polluting gas emissions, innovating recycling technology, and controlled waste management [9].

The source of waste is humans themselves. Therefore, awareness is needed to reduce the amount of waste generated or even not carry out activities that have the potential to cause waste. The implementation of waste management based on zero waste independently is important as an agent of change as well as a block leader at home as a disseminator of information and a motivator for other family members to carry out waste management, especially in sorting waste [2].

The KerDUS community as a community that cares about the environment in Kendal Regency tries to provide education to the community voluntarily to implement a zero-waste lifestyle. Activities carried out by holding workshops on plastics, ecobricks, and the environment. The existence of continuous activities, so that the KerDUS Community is growing. The hope is that the education provided can reduce the contribution of waste. The purpose of this research is to reflect on the zero waste-based waste management education carried out by the KerDUS Community in Kendal Regency, so that its activities will continue and continue even during the Covid-19 Pandemic.

2. Method

This research is a qualitative descriptive study with a phenomenological approach to reflect the phenomena that occur from the point of view of the first person or the person experiencing the phenomenon. This research is focused on the Waste Recycling Craft Community (KerDUS) as one of the communities that educate waste management based on zero waste in Kendal Regency. The research data comes from primary data and secondary data collected by interviewing techniques, questionnaires, participatory observation, and documentation. Data analysis with stages of reduction, data presentation, and concluding to describe the education that has been done by the community and
its impacts. The analysis technique uses source triangulation by matching data obtained from various sources.

3. Results And Discussion

3.1. Characteristics of the KerDUS Community

The KerDUS community was formed in 2017 as a community for selling recycled toys. Several members have attended training on plastic recycling and the manufacture of liquid organic fertilizers held by the government and industry. From this training, other members of the community were taught to practice it. This experience and knowledge encourage the community to care about the environment, especially regarding household waste, which is increasing every day.

The Waste Recycling Craft Community (KerDUS) is a volunteer community that cares for the environment in Kendal Regency which aims to educate the importance of implementing zero waste for life. KerDUS Community members come from housewives, fathers, and several young people from various backgrounds. The KerDUS Community Secretariat is in Kendal Regency, but its members can come from any region as long as they have the same mission to educate zero waste and care for the environment.

3.2. Forms of Education for the KerDUS Community

KerDUS community has several activities to educate the public. These activities are in the form of plastic chanting, training, and exhibitions. Reciting plastic is an activity to gather together with several members to transmit and discuss plastic, ecobricks, and environmental issues. Plastic chanting can be done anywhere and by anyone without any special schedule. The plastic reciters are guided by community members who have attended the training. The form of education for the KerDUS Community is presented in Table 1.

| Type of Education          | Schedule   | Participants | Scope      | Theory                                         |
|---------------------------|------------|--------------|------------|-----------------------------------------------|
| Ngaji Plastik             | Live /     | 2 - 10 people| Local      | Introduction to Plastics, Environment          |
|                           | Scheduled  |              |            | and ecobricks                                 |
| Workshop/Training         | Scheduled  | More than 10 | Regional/  | Introduction of Plastic, Environment           |
|                           |            | people       | National   | and ecobrick, Liquid Organic Fertilizer       |
| Exhibition                | Scheduled  | 2 – 10 people| Local/     | Recycled waste products exhibition            |
|                           |            |              | Regional   | created by the KerDUS community               |

Source: an interview with the head of the KerDUS community

The existence of activities and real examples of the KerDUS community so that some people often invite the community to participate in events, whether in the form of PKK coaching, village health guidance, routine religious studies, school activities, or official activities. Invitations from speakers not only from the Kendal Regency area, some even from outside the region. Therefore the community must prepare volunteers according to its structure to provide training materials so that the education provided can be accepted and practiced by the community. The structural structure of the KerDUS Community is in Figure 1.
The structural structure of the KerDUS community starts from konco resikan consisting of competent participants who have attended the training even once. The next structure is ecobricker who can make ecobricks recycled crafts, log ecobricks, and make modular. Ecobrikers are usually invited to assist their mentors in making ecobricks. Trained ecobrikers will become mentors who will provide local training and have the expertise to make ecobrick products on a modular basis. Competent mentors will be included in the Training of Trainer (TOT) held by the Global Ecobrick Alliance (GEA) to become trainers who can train both nationally and internationally. Trainers who can improve their abilities and concern for the environment will take part in the Training of Master Trainers to become Master Trainers in charge of training trainers in TOT GEA.

The KerDUS community also holds training or workshops in collaboration with villages or schools. Training or workshops are conducted offline and online. Offline or face-to-face training usually collaborates with the village government, schools, agencies, and PKK mothers. Training or workshops are usually scheduled to be held once a month as an annual agenda. The workshop activities apply the concept of zero waste by presenting natural snacks without plastic wrapping and environmentally friendly snack places made of banana leaves. This is one of the implementations of Zero Waste education and caring for the environment. The workshop is held every month with changing speakers and participants. Participants who have participated can participate again in the next event. KerDUS Community Workshops in Kendal Regency include Pucangrejo Village, Gemuh District, SMAN 1 Sukorejo, Singorojo Village, Boja District, Weleri Village, as well as online workshops with participants from inside and outside Kendal Regency.

Plastic, ecobrick, and environmental workshops or training are still running despite the Covid-19 pandemic. According to health protocols, offline training requires all participants and presenters to wear masks and wash their hands before entering the room. The position of the seats during the event also pays attention to the distance between participants and presenters.

Workshops are also conducted online according to health protocols to avoid mass gatherings. Online workshop using the WhatsApp group and zoom application. Advantages Online workshops can be accessed anywhere and by anyone. Participants of the Online Workshop held by the KerDUS Community came from Kendal Regency and outside Kendal Regency. Participants also came from Sumatra and Kalimantan. The weakness of the online workshop is that you cannot meet in person, so you don't know each other. Training is only by imitating examples of uploaded videos/materials and group Whatsapp discussions. Both online and offline workshops aim to educate participants to use plastics wisely and to implement zero waste for the sustainability of life in this biosphere.

3.3. Educational Results of the KerDUS Community
The KerDUS community as a volunteer who cares for the environment educates the making of ecobricks and liquid organic fertilizer (POC) as the initial steps for zero waste. Ecobricks are recycled products of inorganic waste such as plastics, while liquid organic fertilizers are products of organic waste such as kitchen waste and food scraps. During its development, many community members are engaged in other recycling such as coffee wrap creation, plastic flower making, bio-activator
manufacture, pipe decorative lamp creation, maggot cultivation, utilization of used cooking oil into soap, and patchwork creations. Each product has an activity division under the KerDUS community in the form of an ecobrick division, Lentera Com, Gazebo Florist, Bungpi Creation, POC Konco Resikan, Bioactivator, Maggot Conversion, Jelantah Soap, and Patchwork Creation as described in Figure 2.

Recycled Community products are used as tools for demonstration activities, exhibitions, door prizes for activities, and sales. However, the main goal of the KerDUS Community is not for the number of products, but rather to educate the public. So that the resulting product accentuates the origin of the materials used not prioritizing appearance, beauty, or sales profit. An example of the KerDUS Community product in Figure 3.

The KerDUS community tries to educate the public about the importance of reducing self-waste by implementing the 3R (Reduce, Reuse, and Recycle). The results of the questionnaire after training 76% of participants apply the 3R daily both at home and outside the home. The application is by sorting and processing organic and inorganic waste into POC, plastic flowers, multilayer plastic crafts, patchwork, and finally as an ecobrick.

Ecobricks are environmentally friendly bricks by locking organic waste such as plastic, styrofoam, cork, clean and dry cigarette butts in small sizes to be put and compressed into dry plastic bottles until...
they reach minimum weight = bottle volume x 0.33 grams [7]. Ecobricks can accommodate small
plastics of various types and sizes and can pack as much plastic as possible. Ecobricks can be arranged
into modules that can be used as chairs, tables, gates, etc. The ecobrick module is described in Figure
4.

![Ecobricks in modules](image)

**Figure. 4. Ecobrick Module**

One 600 mL bottle of mineral water can hold a minimum of 200 grams of plastic. To be used as a
hexagon module, you need 7 ecobricks with the same size and shape as the bottle. The minimum
amount of plastic needed is 7 x 200 grams = 1400 grams or 1.4 kg of plastic pieces along with 7
plastic bottles for wrapping. It already holds a lot of plastic. Especially if a gate is made that requires a
lego module with a minimum ecobrick of 16 x 15 x 2 poles, with a minimum of 96000 grams of
plastic pieces or 96 kg of plastic that has been saved and used. The advantages of ecobrick products
can be assembled as needed so that the model can be replaced as desired. Ecobricks can also be used
as walls or substitute buildings for bricks arranged using straw or clay. The goal is that the ecobrick is
not directly exposed to sunlight because it will cause the plastic in the ecobrick to fade in color.
Ecobricks can be made in parks and environmentally friendly buildings.

The KerDUS Community of Kendal Regency has been included in the GEA (Global Ecobrick
Alliance) network as a plastic handling community (ecobrick) and an international community that
cares for the environment. GEA will record, track, exchange ecobricks, and give appreciation for their
participation in saving the biosphere by making ecobricks. The KerDUS community, which was still at
the bottom of the list, in 2020 could be ranked 1st in the world with more than 1 ton of plastic that has
been saved to make ecobricks. The KerDUS Community guided the making of a thousand ecobricks at
SMAN 1 Sukorejo, which were done by students and teachers so that they received an award from
LIEPRID in 2019. In 2020 the KerDUS Community guided PKK Sukorejo and Rowosari Subdistricts
so that PKK Sukorejo was ranked 3rd in the world of authenticated ecobrick. The ecobricks are made
of tables, chairs, beds, bookshelves, wall hangings, gardens, and decorations. So that the plastic that
used to be scattered on the streets and trash cans has become a useful ecobrick craft.

The KerDUS community presents the material in a direction starting with an understanding of
plastic and the environment and ending with Ecobricks and Liquid Organic Fertilizers. The goal is to
direct the community about the importance of maintaining the biosphere so that the ecosystem balance
is maintained. The community is given real-life examples of the history of the origin, function, and
dangers of plastic for life, and what it should be done. In addition to plastics, the community is also
given knowledge about organic waste which has the largest composition of 70% from 28% inorganic
waste and 2% B3 waste [2]. Therefore, organic waste, especially kitchen scraps, must be utilized by
storing and putting it in a composter drum specially designed to produce liquid organic fertilizer
(leachate of organic waste), compost (waste dregs), and maggots (high protein decomposers that
emerge from waste). So that one activity can produce three products. Any waste can be put in this
composter drum without needing to be chopped and sorted. POC and compost are used to fertilize
crops that can be cultivated and harvested independently without being contaminated with pesticides
and no need for transportation to buy them. This is one of the principles of zero waste with zero waste,
without pollution, and environmentally friendly. The KerDUS community also produces
environmentally friendly bioactivators from fermented pineapple, brown sugar, and rice washing water for 40 days.

The KerDUS community does not only educate materials, but workshop participants are expected to apply the 3R (Reduce, Reuse, and Recycle) in life to reduce the use of plastics and use plastic wisely. For example, going to the market, carrying a basket of coffee wrappers or a recycle bag of used clothes to carry groceries. When traveling, bring a tumbler as a personal drinking area that can be filled repeatedly. Take place from home when buying food such as meatballs, noodles, etc. Buy and eat foods that are healthy and environmentally friendly. Recycling plastics and other inorganic waste into useful products. Gardening with fences and attractive ecobrick ornaments as a safe and healthy source of vegetables. Walk when traveling in nearby areas or avoid using motorized vehicles. This is an education to implement environmentally friendly living for the sake of sustainability.

4. Conclusion

Zero Waste is one of saving the biosphere for the sustainability of life. The KerDUS community as a volunteer who cares for the environment educates the public by providing training on plastics and the environment, as well as ecobricks and Liquid Organic Fertilizer (POC) as a simple method that can be applied by everyone both at home and outside the home. Education is carried out by chanting plastic, training/workshops, and exhibitions of environmentally friendly products. The results of the questionnaire of participants who have attended the training 76% have implemented the 3R (Reduce, Reuse, and Recycle) in their daily life as a form of environmental awareness. The KerDUS Community prioritizes environmental concern rather than production benefits, even though various recycled products are produced by the KerDUS Community such as liquid organic fertilizers, bioactivators, coffee wrapping crafts, decorative lights, maggots, plastic flowers, patchwork mats, and used soap. The KerDUS community succeeded in working with the PKK mother in Kendal Regency so that more than 1 ton of authenticated plastic for ecobricks has been assembled into chairs, tables, beds, bookshelves, decorations, and gardens. The hope is that the KerDUS Community will not only educate recycled products but be able to shape the character of caring for the environment in the community.

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