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Implementation of the use of plastic waste in Ecobricks for elderly school students in Bantul

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Abstract

Purpose: This study aimed to analyze activities related to using plastic waste in ecobricks for elderly school students. **Methods:** This type of research is qualitative and has a case study design. The sampling technique used is purposive sampling. The data analysis used is thematic research. **Results:** The description of implementing plastic waste into eco-bricks, as well as the preparation, implementation, monitoring, and evaluation stages. The results of this eco-brick-making activity are assessed from the quantity, three or four eco-bricks a month; the quality results are the weight of the eco-bricks according to the standard, and they are made in the form of tables, chairs, and decorations, so that they are more valuable. Environmental changes have occurred since the existence of eco-bricks; no plastic waste is thrown carelessly, and no plastic waste is burned. **Conclusions:** Elderly school students have carried out eco-bricks-making activities so that they impact environmental health for the better.

Keywords: ecobrick; environment; erderly school; plastic waste

INTRODUCTION

Every living human produces waste. As activities increase, more waste is generated by humans. Domestic activities, whether from the household, commercial, or industrial sectors, and industrial activities in the production and supporting processes also generate waste. Waste can pose a threat to life and the ecosystem. If waste is left unmanaged, it will result in mountains of garbage. According to the Strategic Plan of the Ministry of Environment and Forestry 2020-2024 data, the total national waste generation from all urban and rural areas reaches approximately 73 million tons annually. The handling capacity carried out so far reaches about 50% of Indonesia's total national waste generation [1]. In Bantul Regency, waste generation increases yearly, especially plastic waste, which keeps piling up daily. The waste generation value in Bantul Regency per day is 0.437 kg/day/person, with a plastic waste percentage of 8%, the second-highest percentage in Bantul Regency [2].

One way to reduce plastic waste is by reusing it. For example, plastic waste can be utilized to create eco-bricks that can be valuable and useful as building materials, walls, tables, chairs, etc. Ecobrick, in other words, is an eco-friendly brick. Plastic waste is inserted into used plastic bottles of a specific size and pressed until complete, reaching a certain weight and becoming hard, which can be used as a substitute for bricks in building houses [3].

According to Andriastuti's research, the eco-brick-making technique can potentially reduce plastic waste by 77% in the West Pontianak District [4]. The ecobrick technique can be a solution for reducing plastic waste in the environment. Based on a preliminary study in the Pendowoharjo Village area, Bantul Regency, a senior citizen school community has a curriculum on utilizing plastic waste to make eco-bricks. The elderly participants are taught how to make eco-bricks correctly and adequately to be used and have market value.

The efforts made by this senior citizen school include providing knowledge to the elderly on utilizing plastic waste through the creation of eco-bricks and educating the senior citizen school students about waste management methods that do not pollute the environment and positively impact environmental health. This is important because the elderly tend to manage waste by burning it. The presence of education in elderly schools about proper waste management can enhance the knowledge of the elderly. So it is hoped that the elderly can minimize the accumulation of plastic waste. The problem in this research is how the activities of utilizing plastic waste in eco-bricks among elderly school participants are formulated. This research analyzes activities that use plastic waste in eco-bricks among elderly school students.

METHODS

The type of research is qualitative research with a case study design. The research participants consist of elderly school participants, instructors, and administrators, totaling at least 12 people. The sampling technique used is purposive sampling. The data analysis used is thematic, which involves analyzing the data to identify patterns and discover themes.

RESULTS

Making eco-bricks is one of the curricula in the learning (KBM) teaching and learning activities at the elderly school. This activity includes the preparation stage, the implementation stage, and the evaluation and monitoring stage. The preparation stage of the elderly school begins with conducting data collection and assessment of the elderly in the surrounding residential area. After performing data collection and needs assessment for the elderly, the following preparation stage involves creating a lesson curriculum that will be provided according to their needs. This is carried out by the administrators of the Salimah elderly school, also known as Salsa. The administrators and teachers of the elderly school come from the surrounding community and are volunteers who are part of the regional leadership of the Muslimah Brotherhood organization in Bantul.

Then, the curriculum for the elderly school was developed. There are 12 subjects in the curriculum for the first standard level, which can be referred to as S1, and there are several subjects at each level of the second standard or S2, up to the third standard or S3. Each level of the elderly school consists of several sub-themes. The S1 level or standard has four sub-themes: health, social, spiritual, economic, and environmental. This was also conveyed by the elderly school administrators as follows:

"The meeting is once a month, right? There are" four themes; let's say those four are in the 12 materials; the first one is about religion, health, and economic empowerment, one of which is eco brick, right?" (Manager of the elderly school, female)

After the curriculum is established, the next step is forming the elderly school management, recruiting teachers, and all personnel involved, who are socially oriented as volunteers for teaching and therefore not paid. After the data collection of the administrators and teachers, a TOT (Training of Trainers) was conducted. The implementation of TOT (training of trainer) training for the trainers or teachers of the elderly school. The stage of activities before the elderly school is implemented also requires the registration of students or pupils of the elderly school.

Registration is carried out by first conducting socialization at community meetings such as social gatherings, religious study sessions, or meetings at the neighborhood or village level, as well as PKK (Family Welfare Guidance) activities. After the elderly school administrators had socialized the elderly school activities at several community meetings, registration was opened to recruit seniors who wished to attend the informal elderly school.

There are no special requirements to be accepted as a student at the elderly school. All registration forms for the elderly school that are submitted to the administrators become students or pupils of the elderly school. After the prospective students have been registered, the inaugural class of the senior citizen school is conducted. As conveyed by the manager of the elderly school below:

"If the requirement is that they want to,,, want it like that, they are allowed by their families, later there will be a registration form for name, usual biodata, because this is free, right, there are no requirements like that" (Manager, woman).

Preparation before making eco-brick, during the session on eco-brick material, the elderly school students prepared the tools and materials for making eco-brick, especially the specified plastic bottles, Aqua brand plastic bottles (chosen because the material is easy to obtain) with a size of 600 ml, plastic waste from the use of household consumption items such as coffee sachets, sweetened condensed milk, instant noodles, drink sachets, shampoo, detergent, air fresheners, and plain plastic shopping bags commonly used for shopping, etc. For the tools needed to make ecobricks, scissors are required to cut the waste into small pieces, and a small wooden stick is also needed to push the plastic waste into the plastic bottle.

The second phase of this activity is the implementation stage of the elderly school, which begins with the inaugural class of the elderly school. This class aims to provide information about implementing senior citizen school activities, the subjects taught, the rights and obligations that senior citizen school students will receive, and the distribution of ID cards or student name tags. This inaugural class also officially opens the senior citizen school that will be held in the Krandohan hamlet. The inauguration was attended by students, administrators, teaching staff representatives, and local community leaders, including the village head, RW/RT heads, and PKK chairperson.

After the inaugural activity, the next period is the implementation of the senior citizen school activities, which are held once a month for 60-90 minutes for each meeting. The duration is divided into 10 minutes for opening and prayer, 15 minutes for opening and greeting, and attendance one by one by calling the students' names. Next, the school students also do senior citizen exercises or anti-stroke exercises. Then continued with the delivery of material, which could include practice and simulations for approximately 45 minutes, followed by a 15-minute Q&A session. The elderly participants appeared enthusiastic in receiving the material, as evidenced by their eagerness to ask questions and share statements about their frequent experiences. This was expressed by one of the instructors at the senior school:

> *"The elderly, when they are enthusiastic, sometimes the time for questions is already over, sometimes even after a long time, there are still those who want to ask various things, yes, they look very enthusiastic when they are in school..." (teacher at the elderly school, female).*

Every month, the elderly school students are given different materials according to the curriculum prepared by the administrators and teachers of this elderly school. There are several subjects or major themes taught, including dementia/senility, hypertension, coronary heart disease, diabetes mellitus, nutrition for the elderly, ESQ and stress therapy for the elderly, rheumatism in the elderly, foot exercises, sports for the elderly, brain exercise therapy, dental and oral health for the elderly, as well as religious materials such as light practices to open the path to heaven, prayer and health, dhikr for the health of the elderly, and improving Quran recitation. Additionally, there are materials on social and economic topics that can broaden the knowledge of the elderly students at the school. The methods used in teaching elderly students vary, from theory to practice.

Theory that is not too dominant and emphasizes more practice and discussion is prioritized by the instructor in transferring knowledge to elderly students, most of whom have a lower to intermediate level of understanding. The practices taught included exercises, making ecobricks, practicing "my plate," deep breathing exercises, etc. The delivery of material and Q&A session lasted for 45 minutes, and finally, several elderly participants shared their thoughts or comments after receiving the material that day. Some notes regarding the implementation of the elderly school are that the instructors must deliver the material cheerfully and make the elderly attendees happy.

The instructor provided the material on ecobricks for a longer duration due to the practical activity of making ecobricks. The ecobrick material provided includes the background of ecobrick, the dangers of plastic waste, the definition of ecobrick, the goals and benefits of ecobrick, the waste materials used to make ecobrick, and the steps in making ecobrick, as well as the practical session of making ecobrick by the elderly school students. During the ecobrick-making training, the elderly school students were previously asked to bring their equipment from home, including plastic waste, scissors, a pushing stick, and a 500 ml mineral water bottle.

During the ecobrick-making training, the elderly were taught how to clean plastic waste, cut the plastic into small pieces, select suitable plastic to put into the plastic bottle, the types of plastic that can be put into the ecobrick bottle, and how to compact the plastic in the bottle by pressing and slowly rotating it so that the plastic inside becomes dense and there are no gaps. After the ecobrick-making training, the elderly school students were asked to practice making ecobricks from their household waste at home. Then they are collected at the school during the next senior school session.

The implementation of the elderly school in the Krandohan hamlet does not charge a single cent for the elderly who wish to become its students. However, some elderly school students have taken the initiative to collect contributions to support the agendas that the elderly school in the Krandohan hamlet will carry out.

The third or final stage of this elderly school program is the evaluation and monitoring stage. In the monitoring phase of the senior citizen school activities, one of the curricula involves making ecobricks, which is carried out during the teaching and learning sessions, ensuring that the elderly participate (not absent), and the result is that 100% of the elderly school students follow the material on ecobricks. The evaluation of the absorption of learning about ecobricks is conducted after school, by having the instructor randomly ask the elderly students about the definition of ecobricks, the waste that can be used as ecobrick material, and the benefits of ecobricks, which are answered by the elderly. The evaluation stage of learning achievement is also conducted after receiving material on ecobricks, where the elderly make ecobricks at their respective homes. Supervision is carried out by teachers and the elderly school administrators who visit the elderly's homes to inquire about the ecobrick results and provide assistance if there are any difficulties.

One of the efforts made by the elderly school management to increase the motivation and enthusiasm of the elderly in making ecobricks is to hold an ecobrick competition among the elderly with cash prizes of Rp. 500,000 for the first place, Rp. 300,000 for the second place, and Rp. 150,000 for the third place. It turns out that this competition has motivated the elderly to make ecobricks. As expressed by the following elderly school students:

"Yesterday there was an ecobrick competition with cash prizes, so we were excited. People won 500 thousand, 300 thousand, and 150 thousand, how could we not be happy..." (Elderly school student, female).

The ecobrick results produced by the elderly school students are all collected in one place, at the manager's house, which serves as the venue for the teaching and learning activities of the elderly school students. The ecobrick is valued at 1,500 rupiah for each bottle the elderly bring, provided that the ecobrick weighs 2 ounces for a 500 ml bottle. The elderly receive all proceeds from the sale of these ecobricks. The elderly school manager then sells these ecobricks to the Gemah Ripah waste bank. The Gemah Ripah waste bank needs a lot of ecobricks to build houses from those ecobricks. However, the elderly school management did not record how many ecobricks were produced by their elderly students and how many elderly students utilized these ecobricks.

The ecobrick results produced in this activity are related to the quality and quantity of the ecobricks. The amount refers to the number of ecocks that school students can grow in one month. Each elderly individual has different abilities in making and producing an ecobrick. On average, one elderly person can make and produce one ecobrick in one week or three to four ecobricks in one month.

"One ecobrick takes quite a long time... because you have to collect the trash, then wash it first, then dry it, cut it into pieces, and then stuff the plastic in... once you stuff it, it doesn't get full immediately and the weight needs to be just right, so the process takes about a week." (Senior school student, woman).

The quality aspect of the ecobricks collected at this school is that they meet the standard requirements and are marketable. The criteria are bottles that are 500 ml in size with an ecobrick weight of 200 grams or more, and bottles that are 1.5 liters in size with a weight of 500 grams. From the weight of the ecobrick, its density can be determined, so if used as a basic material for building houses, it meets the standard, meaning the bottle has no cavities and has a solid property similar to a concrete block.

In terms of environmental changes, it is observed that there was a change in the environment during the training in making ecobricks, meaning the change that occurred was the reduction or absence of scattered plastic waste around the homes of the elderly in the Krandohan hamlet when the elderly school was still being held. The change after the elderly school activities and the students learned about ecobricks was that they no longer burned plastic waste due to the elderly students' understanding of the dangers of burning waste, especially plastic waste. In addition, there has been a change in the behavior of the elderly, who used to throw away plastic waste but now collect plastic waste. The elderly students even try to ask their neighbors for plastic waste so that it can be used as raw material for ecobricks.

The environmental change is that no plastic waste was found scattered around the homes of elderly students, especially the type of plastic that can be made into ecobricks, such as plastic waste from instant noodle packaging, snack packaging, wrappers, straws, detergent packaging, cooking oil packaging, candy wrappers, and plastic bags. This is because the raw material for making ecobricks requires a significant amount of waste to be packed into mineral water bottles to make them dense, prompting the elderly

students to search for plastics as the raw material for ecobricks. Due to the COVID-19 pandemic, the teaching and learning activities at this elderly school are suspended, and there are no activities. The researcher observed that the environment around the elderly house did not have scattered plastic waste. Some elderly people still keep plastic wrappers or bags to be used as raw materials for ecobricks. However, it is still unknown when the elderly will resume school activities. A senior school student replied,

"....since the ecobric replied, event last time, it has been clean, especially during the competition and graduation ceremony. After that, if there is plastic waste, we collect the plastic waste little by little, and it can be used again to make ecobricks later.." (Senior citizen school student, woman)

DISCUSSIONS

The senior citizen school is one of the informal education models aimed at the elderly in the community. In line with its objectives, this elderly school seeks to enhance the knowledge of the elderly regarding health, socio-economics, and spirituality, leading to an independent and high-quality old age. The community carries out this activity through existing organizations in the community according to the needs of the elderly. One of the subjects in the elderly school curriculum is ecobrick making. The making of ecobricks is included in the economics curriculum, as it is considered easy for the elderly to make and can generate income for them.

Informal education through this elderly school effectively enables the elderly to understand information on managing plastic waste into ecobricks. This is in line with the findings of Nurhayati's (2021) research, which states that informal education in the community, such as the community learning center model, includes virtual socialization and community assistance on information literacy, activating community reading centers to create discussions, fostering critical thinking in the community, and enhancing information. This research shows that community education can improve society's information literacy.

Latchem also reinforces the idea that informal and non-formal education can help various groups of learners achieve a more desirable and beneficial state for themselves and their communities. Elderly students through the elderly school have good knowledge about eco-bricks and a deep understanding of waste. Law No. 18 of 2008 on Waste Management states that waste is the residue of human daily activities or natural processes in the form of solid or semi-solid organic or inorganic substances that are biodegradable or non-biodegradable, considered no longer helpful, and disposed of into the environment. In addition to understanding waste, plastic waste must be managed to prevent it from polluting the environment. Pani et al. state that plastic waste is an inorganic waste that cannot be easily decomposed and takes years to break down. Plastic is a raw material obtained through synthesis from various raw materials, such as petroleum, natural gas, and coal. Plastic is a polymer compound whose main components are carbon and hydrogen. The types of plastic widely used in society are polypropylene (PP) and polyethylene terephthalate (PET/HDPE). Polypropylene plastic is commonly found in plastic bags. Meanwhile, polyethylene terephthalate is frequently found in glass products and packaged drinking bottles. After obtaining the materials for making ecobricks, the elderly students began making ecobricks step by step, starting with preparing the tools, cutting the plastic waste, and then putting the small-cut plastic into mineral water bottles and pushing it down with wood to make it dense and weigh 200 grams in a 500 ml bottle.

As revealed by Russel Maeir and Ani Himawati, who founded the Global Ecobrick Alliance (GEA), the eco brick movement was initiated in Yogyakarta in 2016. An eco brick is a plastic bottle filled with clean and dry used plastic until the bottle is full and compact. Elderly students make eco-bricks that are ensured to be dense and meet specific weight standards. This also means that eco-bricks function as reusable building blocks. Ecobrick can be used to produce a variety of items, including furniture, garden walls, and other buildings.

One way to manage plastic waste is by utilizing plastic waste with the Ecobrick technique. Ecobrick is one of the creative efforts for handling plastic waste. Ecobrick handles plastic waste by trapping it so it is not disposed of in the environment. The function of ecobrick itself is not to destroy plastic waste but rather to extend the lifespan of those plastics and process them into something useful that can be utilized for the benefit of humanity in general.

The number of ecobricks produced by school students in one month varies depending on the condition and ability of the elderly. On average, one elderly person can make and produce one ecobrick in one week or three to four ecobricks in one month. The number of elderly people in Pedukuhan Krandohan is 28, so they produce 80-95 eco-bricks in a month. As stated in Suminto's research, producing ecobricks regularly once a week or once every two weeks deserves appreciation. This is because when a large

amount of plastic can be contained in a single mineral water bottle, it can create significant awareness and concern about how difficult it is to insert plastic into the bottle, push, and compact it to make a single ecobrick that can be useful. The emergence of this awareness can encourage people to value the existence of plastic waste as something more valuable. This is also supported by Antico's research, which reveals that making ecobricks helps the community understand plastic waste. This research shows why it is suggested that ecobricks can be a sustainable alternative for managing plastic waste that can be used as non-structural construction materials.

Asih's research, has proven that there are two types of ecobrick compression test results based on the eco-brick compression test results. When the ecobrick is bent, only part of the ecobrick bears the load, resulting in a measurement equivalent to an ecobrick with a volume of 600 ml. The average mass of the ecobrick with a 600 ml bottle is 262.8211 grams, with a mass range of the ecobrick between 250.69–280.72 grams, and the average mass of the ecobrick with a 1500 ml bottle is 582.8444 grams, with a mass range of the ecobrick between 549.2 grams - 629.2 grams. This shows that the ecobrick meets the mass standards and the procedures for making ecobricks.

In addition to making ecobricks, the elderly school students also developed ecobricks into more valuable items such as tables, chairs, and wall decorations. This is also supported by Gery's research, which shows that the most commonly found inorganic waste in the community is plastic waste, which is utilized for creating plastic waste creations, Ecobrick, which generates high economic value by producing decorative chairs and tables. In addition to being environmentally friendly, Ecobrick's benefits include reducing waste and plastic bottles in the environment of Kampung Teluk Angsan.

One of the goals of eco-bricks is to reduce environmental pollution. The form of commitment and tangible support from the elderly school administrators was evident through the theme of the grand graduation of the elderly school at the end of 2019, which was "Healthy Elderly and Concerned About Plastic Waste." The elderly school is serious about supporting the Bantul Regency government in reducing the volume of plastic waste. The generation of waste, especially plastic waste, in Bantul Regency continues to increase yearly.

The lesson on ecobricks has made students aware that they should not throw plastic waste anywhere, so their living environment looks cleaner now.Unmanage plastic waste has long-term impacts. Humans generate a significant volume of plastic waste due to its single-use nature. According to Verma et al., in India, urban waste containing 10-12% plastic waste is managed by incineration, which can release toxic gases into the environment. When plastic is burned, poisonous gases such as dioxins, furans, and polychlorinated biphenyls are released into the atmosphere, and it is also noted that 20% of greenhouse gases are produced from landfills in India. According to the research by Andriastuti et al., the eco-brick-making technique can reduce plastic waste by 77%. This is because the ecobrick technique can lock scattered plastic waste inside plastic bottles in the environment until it becomes solid and can be used. This ecobrick technique can be a solution for reducing plastic waste in the atmosphere.

The fundamental aspect of plastic waste management is to reduce waste as much as possible. Reusing plastic waste as eco-bricks is one alternative to turning plastic waste into something more beneficial. The use of recyclable plastic waste also has a significant impact on improving the environment, as revealed by the research of Brooks et al. Types of plastic waste, such as the group of polymers often used in single-use plastic food packaging (polyethylene, polypropylene, and polyethylene terephthalate), require global actions to reduce pollution by decreasing the amount of non-recyclable materials. Product redesign and funding for domestic plastic waste management are necessary to minimize waste generation [14].

CONCLUSION

An overview of the implementation of utilizing plastic waste in eco-bricks for elderly school students includes three stages: the preparation stage, the implementation stage, and the monitoring and evaluation stage. The results of the eco-brick-making activities are assessed based on quantity, as seen from the number of ecobricks made by the elderly students, three or four ecobricks per month. The quality results are evaluated based on the weight of the eco-bricks, which meet the established standards, and the eco-bricks are made into forms such as tables, chairs, and decorations, making them more valuable. There has been an environmental change, as no plastic waste is found discarded carelessly, and there has been no burning of plastic waste since the elderly learned and made eco-bricks.

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