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Environmental Education Innovation: Transforming Household Waste for Sustainable Living

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ABSTRAK
This research explores how environmental education can be implemented using household waste, especially inorganic waste. Ecological education is an effort everyone makes to support environmental sustainability for sustainable survival. The increasing volume of waste demands serious attention to waste management. Waste management that is not environmentally friendly can hurt health and disrupt environmental functions such as settlements, forests, rice fields, rivers and oceans. Household waste, included in the inorganic waste category, is a source of pollution that is dangerous for the environment and human health because it consists of chemicals and cannot be renewed but is often ignored. Utilizing inorganic waste is one step all communities can take to preserve the environment. This research is descriptive and based on literature observations. Through sustainable environmental education, awareness of the importance of handling inorganic waste can increase in all levels of society.

1. INTRODUCTION

According to Law No. 18 of 2008, waste is defined as residue from daily human activities or natural processes that is in solid form. Waste management refers to a series of activities carried out systematically, comprehensively and sustainably, including reducing and handling waste(Nggeboe, 2016). Waste can be classified based on its physical and chemical properties as follows: 1) Organic waste, such as vegetable waste, meat, leaves, and the like, which rot quickly; 2) non-organic waste, such as plastic, paper, rubber, metal, leftover building materials, and others that do not rot quickly; 3) Dust or ash; and 4) Hazardous waste (B3) for health, such as industrial and hospital waste which contains dangerous chemicals and disease agents(Suryani, 2014).

Environmental education is a process that aims to form awareness and concern for the environment and all issues related to it among all people in the world(Rahmila et al., 2024). This involves developing knowledge, skills, attitudes, behavior, motivation and commitment in society to jointly solve current environmental challenges and prevent the emergence of new problems. Environmental education also pays attention to affective aspects such as behavior, values, and commitment, which are needed to form a sustainable society(Sari et al., 2023).

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The increase in population, changes in consumption patterns, and the evolution of people's lifestyles have led to a rise in the amount, type, and variety of characteristics of waste produced. The high purchasing power of the community for various kinds of products and technology, along with economic growth followed by additional activities to support the economic development of a region, also plays a role in increasing both the quantity and quality of waste produced(S. Marpaung et al., 2023). This growth in waste volume requires effective management. Waste management that does not use environmentally friendly methods and techniques has the potential to negatively impact health and disrupt the ecological function of the environment, including settlements, forests, rice fields, rivers, and oceans(Saputro et al., 2016).

Several steps have been taken at waste disposal sites (TPS) to reduce the volume of waste, such as sorting efforts carried out by scavengers to identify waste that can be recycled(Andayani et al., 2023). This becomes a source of income for them. A composting process is carried out to deal with waste that rots quickly(Kahfi, 2017). However, even though these steps have been taken, waste still requires further management at quite a significant cost and land. Handling residual waste at TPS still involves open burning and natural decomposition, which can cause new problems such as soil, water and air pollution (S. S. M. Marpaung, Yunasfi, et al., 2022).

Waste management aims to improve public health, maintain environmental quality, and utilize waste as a resource. From an environmental health perspective, waste management is considered adequate if it can prevent the spread of disease and avoid environmental pollution. Apart from that, good waste management does not cause air, water or soil pollution, does not produce disturbing odors, does not pose a fire risk, and meets various other criteria to maintain aesthetic value and environmental sustainability(S. S. M. Marpaung et al., 2023).

Waste management in urban areas is influenced by various factors that can encourage or hinder community participation in waste management efforts. According to research by (Marshush et al., 2023), these factors include education level, location of trash bins in the house, presence of scavengers, cleanliness initiatives, regulations related to waste management, and law enforcement. Most of the waste produced comes from households(Has, Marpaung, & Sari, 2023). Therefore, community participation in decision-making, management, and supervision of waste management is essential. The method of community participation in waste management must take into account local cultural characteristics and values. Based on this principle, every individual and community group, including entrepreneurs and residents in RW 12 Kabila Village, Pauwo District, Belawan Regency, has the responsibility and right to participate in the use and management of waste to create a clean, healthy and comfortable environment.

2. METHOD

Implementation of research: This activity was conducted on Friday, 28th to 30th September 2023. The material presented was environmental pollution and cleanliness of the environment around the household. Participatory Observation: Observe and engage in environmental education and waste management activities. In-depth Interviews: Interview program participants to understand their views and experiences

regarding household waste transformation. Document Analysis: Collects data from educational materials, lesson plans, and related program documentation.

3. RESULTS

Environmental education, as we know it, includes formal education from elementary school (SD) to tertiary education (PT), intended to introduce the positive and negative impacts of the environment. In this context, waste is one of the main topics from industry and households. Waste, which results from waste, requires an environmentally friendly approach to be utilized properly and has no detrimental impact. Studies show that waste that is not managed correctly can be hazardous, and currently, the focus of discussion is on household waste, especially inorganic waste.

In Indonesian, waste is defined as the product from the production process, both in industrial and household contexts. Various types of waste are generated in people's homes, including garbage, domestic wastewater, and wastewater from various other domestic activities. Solid waste, commonly referred to as trash, is often considered undesirable because it lacks economic value. Chemically, this waste consists of organic and inorganic compounds. With specific concentrations and amounts, waste can hurt the environment, especially human health, so waste management is necessary(S. S. M. Marpaung, Masy'ud, et al., 2022). The level of danger of poisoning caused by waste depends on the type and characteristics of the waste itself.

Of the various types of household waste, some are significantly dangerous to the environment and human health, namely inorganic waste, although it is sometimes considered trivial. According to literature research, waste can be divided based on its type into Garbage (food waste that rots quickly), Rubbish (waste that does not decompose easily), Ashes (ash from burning), Dead animal (animal carcasses), Street sweeping (Garbage strewn across roads), and Industrial waste (solid waste from industry). The negative impacts of increasing volumes of waste that are not appropriately managed include health problems, decreased environmental quality, decreased ecological aesthetics, and obstacles to development. To achieve effective waste management, it is essential to follow the waste management philosophy, namely that the less and closer the waste is managed to its source, the easier and better it is collected, and the less environmental impact it will have.

Inorganic waste is a type of waste that comes from non-biological materials, whether synthetic products or the results of technological processes processing mining materials or natural resources. Inorganic waste cannot be decomposed by nature and is generally included in the dry waste category, which does not spoil quickly. Examples of inorganic waste include plastic bottles, plastic bags and cans.

According to the (Ati et al., 2023), inorganic waste, also known as dry waste, includes plastic food packaging, paper, plastic toys, drinking bottles and glasses, and cans. This type of waste cannot be decomposed naturally by the environment. However, this waste has the potential to be sold and processed into other products that can generate profits. Apart from being sold, inorganic waste can be used as material for household decorations and equipment or for making fine art. Some examples of inorganic waste that can be sold and processed into new products include plastic food packaging, used drink bottles and glasses, cans, glass, and various paper

types such as newsprint, HVS, and cardboard. An image of inorganic waste can be seen in Figure 1.

Figure 1. Inorganic waste

Discussion

Negative impacts of inorganic waste

1. Lack of waste management will create an uncomfortable environment for the community, with unpleasant odors and wrong views because rubbish is scattered everywhere, hurting the aesthetics of the environment.

2. Inadequate waste management can cause a decline in public health. This can result in increased direct costs for health care and indirect costs such as lost productivity due to work absenteeism.

3. Disposal of solid waste into water bodies can cause flooding and impact public infrastructure such as roads, bridges and drainage channels.

4. Other infrastructure can also be affected by inadequate waste management, such as highwater treatment costs. A lack of efficient waste collection facilities can encourage people to throw rubbish on the streets, increasing road maintenance and repair costs.

Utilization of Inorganic waste

Inorganic waste comes from non-biological materials, which do not come from living things and take a long time or cannot even decompose naturally. Some examples of inorganic waste include styrofoam, plastic, cans, and glass. One way to utilize inorganic waste is through the recycling process. Recycling is an effort to process goods or objects that are no longer used so that they can be used again. Several types of inorganic waste that can be processed through recycling include plastic, glass, metal and paper.

1. Plastic waste

Plastic waste is usually used as packaging for goods. Plastic is also used in household furniture, such as buckets, plates, glasses, etc. The advantage of plastic items is that they are durable and do not rust. The extensive use of plastic impacts the amount of waste plastic. However, disintegrating naturally if buried in the ground requires a very long time. Therefore, efforts that can be made are: Utilize plastic waste to be recycled into items with the same function as its original function or used for a different function. For example, a bucket Used plastic can be recycled, and the recycling results after being crushed can be in buckets or made into other products such as plastic spoons, trash cans, or flower pots. Plastic from used snacks or detergent soap can be recycled and remade into crafts such as pockets, wallets, laptop bags, shopping bags, sandals, or umbrellas. Used drink bottles can be used to make children's toys. Drink straws can be made into flowers, ashtrays, pots, photo frames, tablecloths, tables, wall hangings or other decorations.

2. Metal waste

Waste from metal materials such as iron, cans, aluminum, tin, and so on can easily be found in our surrounding environment. The trash from cans is usually the ones we find the most and the ones we can most efficiently use into something useful. Waste from cans can be used in various types of helpful craft items. Multiple products are available from canned waste, including trash cans, flower vases, hangers keys, piggy banks, gif boxes etc.

3. Glass or glass waste

Glass waste or broken glass can be recycled into goods the same as the original item or becomes another item such as a new bottle, vase flowers, souvenirs, or other decorations that have artistic value and economical.

4. Waste paper

Paper waste can be recycled either directly or indirectly. Directly means that the paper is made now into crafts or other valuable things. Meanwhile, this indirectly means that the paper can be melted. First, it becomes paper pulp, and various crafts are made. Results Many types of paper recycling include decorative boxes, book covers, frames, photos, pencil cases, etc.

According to the (Kahfi, 2017); (Has, Marpaung, Jati, et al., 2023) The explanation above shows that inorganic waste takes tens or even hundreds of years to decompose completely. However, the negative impact of plastic waste is proportional to its function. It takes around 1000 years for plastic to decompose naturally in the soil. This is a very long period, and as plastic breaks down, its particles can contaminate soil and groundwater. If burned, plastic waste will produce toxic fumes which are dangerous to human health. An incomplete combustion process can cause plastic to produce dioxin compounds, which are very harmful if inhaled by humans. The impacts include increasing the risk of cancer, hepatitis, liver inflammation, nervous system disorders, and depression.

To deal with this waste problem comprehensively, appropriate processing alternatives are needed. Although landfill technology is expected to solve the waste problem, this creates new environmental problems. Damage to soil, groundwater and surface water due to leachate from landfills has reached a level that threatens public health, especially regarding ecological sanitation.

The basic description of the application of sanitary landfill technology is the need for large areas of land to handle large volumes of waste. This technology was initially planned for use in cities with significant and affordable land. However, land in various big cities in Indonesia is minimal, with high prices. Although sanitary landfill technology is still used in the research area, with increasingly narrow land due to housing development, this needs to be solved. Considering these constraints, the most suitable technology to overcome this problem is efficient waste disposal technology in land use. The central concept is to reduce the volume of waste to the maximum. One technology that can answer this challenge is incineration or controlled burning using an incinerator. This technology requires less land and produces less residue than the initial waste volume.

However, implementing this technology hurts the environment, especially air pollution. Combustion products such as COx, NOx, SOx, particulates, dioxins, furans and heavy metals released into the atmosphere must be considered. The incinerator process also produces Dioxin, which can cause various health problems such as cancer, immune system disorders, reproductive disorders, and growth problems.

Therefore, plastic materials can be considered environmentally unfriendly and unconservative if used without clear limitations. However, in everyday life, especially in Indonesia, plastic products are widespread in various activities. In fact, with higher awareness, we can take steps to reduce the negative impacts. One step that can be taken is to reuse the plastic bags that we already have (reuse) as an alternative to reducing plastic waste that is wasted after use (decline). It would be even better if we could recycle plastic into more valuable items (recycle). Imagine if each person used 60 plastic bags in one month to shop for food at the stall; a lot of plastic waste would just be thrown away. If only one neighborhood had this, with a population of 800 people, 48,000 plastic bags would be collected, polluting the environment.

The law regarding waste management has stipulated several prohibitions, including the ban on throwing rubbish in places that do not comply with the specified provisions, burning rubbish without meeting the defined technical requirements, and handling waste by open disposal at Final Disposal Sites (TPA). The closure of landfills using the available disposal method must be stopped within five years after Law No. 18 of 2008 came into force. To utilize waste, stakeholders such as local governments, entrepreneurs, NGOs and the community must be actively involved.

Through learning from waste management programs that have been carried out, the approach to handling waste as a product that is no longer useful and tends to be thrown away must be changed. Utilizing inorganic waste is one way to increase awareness of waste problems and encourage actions that care more about the environment.

4. CONCLUSION

With the enactment of Law No. 18 of 2008 concerning Waste Management, efforts and awareness of the importance of effective and appropriate waste utilization and management must be developed in every community environment. This aims to improve health and environmental quality and transform waste into resources to improve community welfare. To utilize and manage waste, it is essential to involve various components of society and pay attention to the characteristics of waste,

environmental conditions and socio-cultural factors of local communities. Inorganic waste, in particular, severely threatens the ecological ecosystem.

Based on the discussion above, the planning process for the use and management of household waste in the community begins with making an initial agreement, identifying problems, assessing the carrying capacity of the environment, and, most importantly, involving active community participation in the use and management of household waste.

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