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Towards Schools with Zero Waste

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Goal: Optimal use of recycled school materials for educational and research purposes

Introduction:

One of the significant challenges the world faces today is addressing environmental issues. The substantial amount of waste produced globally, a significant portion of which could be recycled and reused but is often left unused, exacerbates the planet`s deteriorating condition each day. The inadequate separation of dry and wet waste, coupled with the challenges surrounding recycling processes, places a significant burden on the earth. Addressing these issues has become increasingly complex, exacerbating this enormous problem day by day.[1]

As The planet continues to suffer from this escalating issue daily, it becomes increasingly crucial to educate children and future generations on responsible environmental practices to safeguard our world. Educating children about environmental responsibility is equally as important as teaching them literacy, as their future lives and health depend on the well-being of our planet. Educating and informing children on the reuse of recycled materials is a significant step towards cultivating responsible environmental stewardship and safeguarding the planet for future generations.[2]

Schools serve as the ideal environment for cultivating environmental awareness, as they are responsible for educating and nurturing future generations and provide an atmosphere where students spend a significant portion of their time.[3]

In pursuit of this objective, the present study was conducted within an elementary school setting to engage students on the subject matter. As a pioneering school in this field, it has the potential to serve as a model for other educational institutions, enabling higher-level institutions to apply the findings of this research on a broader scale.[4]

Types of wastes

In each school, waste generated throughout the day can be categorized into three primary and essential types.[5]

- Contaminated waste such as: paper towels, tissues

- Dry waste such as: paper and pencil shavings, plastic bottles and glasses

- Wet waste (Organic waste) such as: comprising leftover food, fruit and vegetable peels [6]

Contaminated waste that needs to be destroyed and removed from the school premises and cannot be recycled. Schools and other institutions typically have specific policies in place for disposing of contaminated waste.

Dry waste which can be easily separated from other types of waste and recycled. Recycling dry waste is an essential aspect of sustainable waste management, helping to conserve natural resources, reduce energy consumption, and minimize the amount of waste sent to landfills.[7]

Wet waste, also known as Organic waste, can be separated from other waste streams and recycled through composting or other methods. However, composting often requires specialized equipment like a composter, which may not be financially feasible for many schools, particularly public institutions. so focusing on dry waste, such as paper and pencil shavings, is a more practical approach for schools to promote recycling and waste reduction. Paper waste, including paper sheets, notebooks, and cardboard boxes, is a significant component of school waste. Recycling paper not only conserves resources but also reduces greenhouse gas emissions associated with paper production. Pencil shavings, although small in size, can accumulate over time and contribute to waste volume. Collecting and repurposing pencil shavings as compost or mulch can provide additional recycling opportunities within a school setting.[8]

By concentrating on dry waste items like paper and pencil shavings, schools can establish practical recycling programs that are both cost-effective and eco-friendly. These initiatives foster a culture of sustainability and educate students about the importance of responsible waste management.[9]

Research location

This research was conducted at a primary school located in the Tehran province of Iran. The primary school has an annual enrollment of approximately 400 students, distributed across 11 classes and three educational levels, ranging from the first to third grade. on average, each class comprises around 40 students.

Research method

To conduct this research over a one-month period, two second-grade students from the school were responsible for collecting dry waste in two separate baskets - one for paper and the other for pencil shavings.

Our goal in collecting these waste materials was to return them to their life cycle and promote reuse. This work holds emotional value, as it preserves the memories students leave behind at the school. It is gratifying for each student to know that their time in school has left an indelible, vibrant mark. Furthermore, acknowledging the energy expended in producing paper and pencils over the years, as well as the trees cut down for this purpose, emphasizes the importance of preventing waste and promoting renewal. By returning these materials to their life cycle, students are reminded of the significance of environmental stewardship and the value of renewable resources. [10]To intelligently repurpose these waste materials, such as paper and pencil shavings, consider transforming them into educational tools. In schools, particularly public institutions that often face financial constraints and limited parental resources, the creation of educational aids from recycled materials becomes a priority and necessity. By producing these aids from waste materials, schools can provide effective and valuable support for education while promoting sustainability and resourcefulness.[9]

Given that the materials were collected from a second-grade class, it would be appropriate to create teaching aids specifically tailored to this grade level and aligned with their curriculum. For second-grade students, math topics typically encompass learning about clocks, pattern recognition, geometric shapes, and three-digit numbers. By creating educational aids focused on these subjects, both students and teachers will benefit from the recycled materials, enhancing the learning experience while promoting environmental consciousness.[5]

Calculating Annual Waste Production per Student and the Entire School

The second-grade class, composed of 40 students, yielded 100 grams (0.22lbs) of pencil shavings and 400 grams (0.88 lbs) of waste paper over the one-month collection period. This data enables us to estimate the average waste production per student.[6]

Assuming a student attends school for nine effective months, each student generates approximately 22.5 grams (0.05 lbs) of pencil shavings and 90 grams (o.2 lbs) of waste paper in a single academic year. With a total student population of roughly 400, the school produces around 9 kilograms (19.8 lbs) of pencil shavings and 36 kilograms (79.2lbs) of waste paper annually, considering a nine-month academic year for this research. [7]

Picture1: paper and pencil shaving wastes in 1 month

Transforming Waste Paper and Pencil Shavings into Educational Tools

Both pencil shavings and waste paper can be converted into a paste and then molded into educational aids with the help of materials like glue. Using the papier-mâché method, waste paper was transformed into a paste and dried in sun-exposed molds to create desired shapes. [10]

Picture2: cutting paper wastes

Picture3: converted into a paste

Picture4: molded into educational aids

Picture5: with different color

As an initial experiment with paper pulp, high heat paper was produced as well.

Picture6: the diluted pulp is passed through a strainer

Picture7: high heat paper

Utilizing wood glue, pencil shavings were transformed into boards designed to store clocks and other educational aids.

Picture8: add wood glue to pencil shavings

Picture9: formed in a mold

Through this process, we successfully produced a training clock, a collection of pattern-finding tools, eight training forms, and two paper samples.[1]

These recycled materials effectively meet the requirements for second-grade math education, aligning with the core educational topics. Over time, as the school accumulates more recycled materials, the potential exists to create additional resources such as desks, chairs, and other essential items, ultimately addressing a broader range of the school's needs through sustainable and eco-friendly practices.[9]

Picture10: geometric shapes

Picture11: high heat paper

Picture12: a training clock

Picture13: numbers

Picture14: pattern finding tools

Result: Transforming Waste into Meaningful Educational Resources

Through the creative repurposing of discarded paper and pencil shavings, these once-wasted materials now live on as engaging educational tools, such as clocks, geometric shapes, and numbers. This initiative not only breathes new life into these items but also serves as a lasting tribute to each student's presence in the classroom, leaving a memorable impression that will resonate for years to come.

Lasting Impact on Students and Promoting Environmental Stewardship

Aside from the positive emotions this research may elicit from students, the valuable lessons they learn by observing the recycling process throughout the academic year are crucial. Witnessing the transformation of dry waste into useful resources instills a sense of responsibility towards recycling and waste reduction, inspiring students to handle their tools, books, and notebooks with greater care and sensitivity. By emphasizing the time and effort invested in producing these items, students become more conscientious about preserving and maintaining them, fostering a culture of sustainability that extends far beyond the classroom. Assessing the Rational Impact of Recycling on Educational Resource Production[1]

When approached analytically, a rough estimation reveals the significant impact recycling can have on generating educational resources. While this particular initiative focuses on the early elementary grades (first, second, and third) where pencils are more commonly used than pens, it's important to note that pencil shaving production will decrease in higher grades. Nevertheless, recycling efforts can still play a crucial role in meeting a substantial portion of the school's overall demand for educational materials, promoting sustainability and resourcefulness in the process. Acknowledging Potential Expansion to Other Recyclable Materials[3]

It is important to recognize that this study primarily focused on paper and pencil shavings and did not encompass all forms of dry waste. Future research could explore the recycling potential of other materials, such as glass and plastic bottles, further reducing waste in schools. By extending these efforts to

additional recyclable materials, educational institutions can strive towards achieving zero waste and becoming more self-sufficient, ultimately fostering a culture of environmental responsibility and sustainability among students and staff alike.[4]

List of pictures

Picture1: paper and pencil shaving wastes in 1 month

Picture2: cutting paper wastes

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Picture5: with different color

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