



Trash (Junk) Art: Transforming Trash To Laboratory Tools For Biological Science

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Abstract

With continuous improvement in human life standards, trash accumulation is also increasing exponentially causing environmental pollution and a great dilemma for future generations. However, recycling is being practiced in many countries but only in developed ones. Apart from recycling, transformation and value addition in trash material through trash art can be another breakthrough in managing garbage. An effort is made to utilize and transform trash material into some useful laboratory tools of biological sciences particularly insect rearing cages, birdhouses, dissection needles and blades, aspirators, aley traps, and light traps. All these laboratory tools are of fairly high cost in the market but with trash art, they become very cheap and handy. Such trash artworks can improve the earnings of poor people and can become one of the possible future enterprises.

Keywords: Trash, insects, laboratory tools, fabrication

Introduction

Littering is a common feature of modern societies. It covers a wide range of stuff viz., packing materials, discarded building materials, used electronics and electrical items, etc. Except for decomposable, these discarded materials lead to environmental contamination and garbage accumulation throughout the globe. Not only the urban residential area but the natural water bodies have severely deteriorated (Ahmad, 2021)

Merriam-Webster dictionary says trash means anything useless, worthless, something worth little or nothing, junk, rubbish, something in a crumbled condition, throwaway, or discarded. The general belief, similar to this concept, is to just get rid of it as quickly as possible. People seem to think that trash is unworthy since it is no longer needed or no longer wanted. People always want to get rid of trash instead of thinking of any substitute. (İlhan(2016) advocated that “they forget about it and don’t think about all the time and energy and money put into disposing of it”). There are various points for examination critically because conversion and trash-related issues are not as simple as we think.

Banash (2013) brought out awareness to the advances made in recent mankind's history by advocating that “for the twentieth century, the twin developments of mass production and mass media in the capitalist economies of the [western countries] completed a total transformation of everyday life, reorienting almost

every activity toward consumption.” He has opined that “things once locally produced and often handmade were now mass-produced and modified, turning local, artisanal producers into deskilled laborers serving the assembly line.” As a result, the quantity of goods has significantly increased and their cost is reduced appreciably. Things that used to be reused again and again are being discarded because replacing them with fresh ones is much more reasonably priced. As production rises, the waste material by-product is also expected to enhance. Pye (2010) advocated that “The phenomenon of waste comes clearly into focus not merely as a by-product of manufacturing processes, but rather as an integral element in cycles of production and consumption with more focus on the environmental issue” Rathje and Murphy (1992) stated that “The act of trashing objects and their transformation cycle are not limited to geography, nationality, and modern ages. It is a very popular concept from urban to rural areas, from modern to primitive civilizations.”

In biological sciences, a variety of tools are being used inside laboratories for countless activities viz., dissection of organisms, rearing and handling, mapping dynamics, etc (Machida and Takahashi, 2004). Laboratory tools like rearing cages, insect collection nets and traps, dissection needles, blades, etc, are simple yet very costly in the market (Hamed and Bahseir, 2018). I have, therefore, made an effort to utilize and transform trash material artistically into laboratory tools that would be useful in the study of biological sciences viz., aspirators, insect-rearing cages, insect collection boxes, capturing and counting devices for small insects, light traps, etc. All these laboratory tools are available in the open market at a fairly high cost, however, these can be made with the help of trash and thus become very cheap and handy. Such trash art can also open a new vista for future enterprises and a source of income for needy persons.

Diversity in Trash Art

During the last two decades, much attention has been paid to dealing with the management of waste to protect the environment and ecological issues. Ibarra (2015) describes that “despite a relatively increased awareness about consumption and its consequences, the pace at which we also acquire and dispose of material objects is exploding”. We can easily witness trash in the crowded urban areas “as well as the remotest corners of the world” (Cerny and Seriff, 1996). Trash is found everywhere and produced all the time. It is now impossible to remove it from human activity. “Every day, [people] put unwanted material in toilets and garbage bins, regularly flushing it away or taking it out in bags to be transported far away from their habitat” (Zimring & Rathje, 2012).

Refuse has now become part of everyday activities of men and women and it will never stop being produced. Various life practices viz., traveling short or long distances by any mode, exercising, working in private and public sectors or at home, visiting picnic spots, feeding, and drinking generally leave behind a toll of garbage. It is difficult to claim that every location is free from waste. Nearly every place needs a waste bin, so people can easily throw it away after being used. If people do not find such an arrangement, they also leave their garbage. Trash is found in the streets, the houses of the people, and the sea where men float, swirling around the space in the form of satellite discards. Also, if garbage is attempted to travel away from the habitat of the men, it's as similar as the nearest waste bin. We aren't considering what happens when throwing away garbage. This, nevertheless, temporarily gets away from the individual's life, but not from the surroundings. It gets displaced and stacked in a different location. Trash can be found not only in the most repugnant and avoided areas, but also in the most sterile and regularly visited locations.

Trash production rate is not alike for all or any countries. M. Chen (2020) reveals that after the World Bank's analysis, “the amount of solid waste generated in cities is growing faster than the rate of urbanization.” According to Cerny and Seriff (1996), “A person's wealth has become measured not only in how much he or she can afford to consume but in how much he or she can afford to throw away.” On the other hand, Zimring and Rathje (2012) explained trash differently, they stated that “Our trash is a testament; what we throw away says much about our values, our habits, and our lives, our trash is part of us, whether or not we choose to acknowledge it... The absence of a waste stream aroused suspicion, just as the presence of particular items tells us about the habits of the consumers who generate a waste stream.

Rathje and Murphy (1992) opined that archeologist bins within the residential area were one of the important places to decide what people used to eat in ancient times. Furthermore, scholars believe that there is a strong relationship between technological advancement and the generation of waste. McDonough and Braungart (2010) presented their views that trash could be seen as a result of design and technology. The OECD (Organization for Economic Co-operation and Development) is a global economic agency whose

representatives are mainly from Western developed countries, noting that there is an increasing promotion of huge businesses focused on eco-friendly products and recyclable goods.

Different people interact with trash for different purposes including garbage collectors and artists. People are collecting plastics, scraps, and papers from trash bins and garbage dumps. Collecting such waste and discarding is a major source of economic revenue for the rag-pickers. They pick up and categorize materials used for recycling to sell. They maintain their lives by gathering and selling them. On the other hand, this is not considered garbage for some people as the editor of Garbage issue of ReVista, Erlick, (2015) could witness at Chocó, a poor region on the Pacific Coast of Colombia where Christmas decorations are crafted from used tin cans, old newspapers, discarded textiles and found wood objects. She could realize that it was the practice of recycling. It is very normal for them to use trash repetitively and therefore has become part of their lives.

On the other hand, in developed nations, waste is regarded as an unacceptable thing and must be avoided; therefore, it has no space in their lives. So, it can be simply explained that the relevance of trash differs from one region to another largely on account of the economic condition of the people and their lifestyle. Zimring and Rathje (2012) advocated that “perceptions of waste and the value of material are neither static nor universally shared”. Pye (2010) noted that “at least since the early twentieth century, the concern with discarded things and materials has been a recurring theme in art”. Objects that are known as art could reach the field of art creation in the early 20th century.

The use of non-art objects in art opened up a new vista for the dialect of art-making and exercise and this could show a dramatic shift in the art-making process. Art production and the art methodology changed radically. Sculpture, assemblage, combined paintings/sculptures, and installations have been created from an ever-widening range of unusual objects and materials throughout the twentieth century, as part of the modernist revolt against the use of traditional materials in fine art and the subsequent desire to demonstrate that “art” can be made out of anything among such needs, small tools and equipments of scientific laboratories is another area that can be explored.

Biological Tools from Trash

Certain laboratory tools are necessary for the dissection of insects and creatures of all types, for the collecting and manipulation of specimens, and for the mapping of ecological dynamics (Machida & Takahashi, 2004). These tools are crucial in the field of biological sciences. Even a basic piece of equipment, such as rearing cages, insect collection nets, dissection tools, light traps, and aley traps, can be quite expensive on the open market, as stated by Hamid and Bahseir (2018). This is even though laboratory tools are extremely important in the field of biological sciences. This monetary barrier might be a hurdle to research and instructional efforts, particularly in environments where resources are at a very low level.

After becoming aware of this difficulty, an attempt was made to initiate a novel strategy to transform the materials that are considered to be trash in an artistic manner so that these materials might be utilized as instruments in science laboratories, particularly in biological sciences.

In light of this challenge, I have embarked on an innovative work to transform waste materials into instruments that may be utilized in the laboratory, and that are both affordable and effective. These items include aspirators, insect-rearing cages, insect collecting boxes, and light traps and aley traps (a special trapezium-designed structure to trap soft-bodied insects, especially whiteflies). These instruments can be constructed from easily accessible garbage objects, although they are frequently prohibitively expensive in commercial markets. For instance, spent plastic bottles can be repurposed into aspirators, and the netting that is made from used clothing can be used to gather insects. This approach reduces waste, which not only helps save money but also contributes to the promotion of sustainability.

Sources of Trash

Using door-to-door trash collection and a trash hunt on dumping sites, various discarded materials were collected. The materials were sorted and categorized, so that they can be used in the designing process and hence can be used to make laboratory tools. This methodical collection of waste products also shows the need for community involvement in support of sustainable practices. Table 1 provides full categorization.

Table 1

Trash material collected from different sources for the fabrication of laboratory tools

Sr. No	Trash Material	Resources of Discarded Material
1	Discarded plastic tubes (8 mm)	Hardware shop
2	Thermocol coverings	Packaging
3	False ceiling boards	Interior decoration
4	Iron rods (cut pieces)	Building material
5	Used clothing	Dresses and daily wears
6	Glass pans	Building material
7	Shaving blades	Saloon material
8	Needles	Tailoring shop
9	Disposable pens, transparent fiber sheets	Academic trash
10	Wire	Building material
11	Acrylic window sheets	Building material
12	Plastic containers including bottles	Kitchen discard

Tools used for fabrication include scissors, glue and other sticky materials, electric cutters, hand saw, measuring tape, cello tape, small nut bolts and pins, etc.

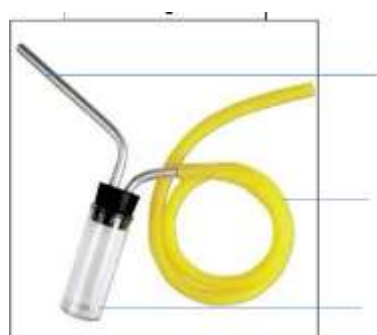
Fabrication of Biological Tools from Trash

Aspirator

An aspirator is a simple device used to collect live small insects for example thrips, whiteflies, jassids, etc., without harming the collected specimens (Golub *et al.*, 2012). It has a small container facilitated with one sucking tube and another one to target the sitting insect to be collected. These tubes are either fitted on the same side or opposite sides sometimes. These collected insects are utilized in further taxonomical, ecological, behavioral, and management studies.

Method of Fabrication

Discarded small plastic jars with their lids and rubber tubes were used to fabricate the aspirator. Two small holes were made in the lid of the container using heated iron rods. Later two pieces of rubber tubes of varying lengths (30cm and 50cm) were inserted into the respective holes; however, one hole was internally covered with cloth through a rubber band (Fig. 1B). This covered tube is used to suck the target insect through another uncovered tube. When the insects are sucked, they get collected inside the container without their physical damage to body parts.



A- Market Product

Sucking tube
Targeting tube
Container



B- Fabricated from trash

Fig. 1 Aspirator

Insect Rearing Cage

Insects are associated with human beings in different ways viz., as pests, beneficial (honey bee, silkworm) insects, and scavengers (Ruchin *et al.*, 2020). Due to their specific associations with different organisms and being economically important, the insects are subjected to various scientific studies relating to their behavior and management. Rearing cage is one of the basic tools to conduct such studies inside laboratories (Kazantsev *et al.*, 2019; Krivosheina & Krivosheina, 2019; Rozhnov *et al.*, 2019; Ruchin *et al.*, 2019). These rearing cages are confined chambers made up either of wood, acrylic, or metallic sheets and wired mesh walls. Rearing cages are however commonly available in the market but at fairly high prices (Fig. 2A).

Method of Fabrication

Discarded thermocol sheets (packing material) were used to fabricate the insect-rearing cages. These sheets were cut into equal sizes of squares and fixed against each other to give a squared chamber look with the help of a glue gun and fevicol (adhesive agent). In the front sheet, one circular hole (6cm diameter) was cut with the help of a tapering wood saw, commonly available with carpenters. A cloth sleeve collected from a discarded man's shirt was fixed on the mouth of the hole to facilitate access of hand inside the cage (Fig. 2B).



A - Available in the market.



B - Made from trash

Fig. 2 Insect rearing cage

Needles and Blades for Dissection

In biological sciences, the dissection of organisms (frogs and insects in general) is important to study their internal anatomy. Like medical sciences, there is a good demand/need for dissection needles and blades (Golub *et al.*, 2012). The needles and blades available in the market cost a good money from the pocket of students as well as guardians. Also, in the case of insects, these available needles and blades fail to serve the purpose effectively due to their shape and size (Fig. 3A).

Method of Fabrication

Discarded use and throw pens, needles, and fresh shaving blades were utilized. The writing point of the pens was removed and needles heated on flame were inserted into the pens. In the case of dissection blades, long triangular pieces were cut with the help of scissors, and the wide end of such pieces was inserted into pens by heating. Such prepared needles and blades have a pen-like grip which is more important during dissection (Fig. 3B).



Dissection knife available in the market

Figure 3 A

Dissection knife and needles fabricated from trash.

Fig. 3 B**Bird House**

The birdhouses are simple hut-like structures, usually made up of wood and plywood being widely used in Anthropology. These houses are fixed on trees between two adjoining branches and on home terraces or hung from trees by a metal hook fixed on top of the house. These birdhouses are readily available in the market and at a very high price (Fig. 4A).

Method of Fabrication

A discarded thermocol (polystyrene) rectangular box (35x45 cm), used in packing relatively large electrical/electronic gadgets, was arranged from the local market to fabricate the birdhouse. Generally such packing material is available as a combination of two rectangular or circular divisible parts for packing the material to protect it from any physical damage during transport. The opposite end of the half of the empty rectangular box, after removing irregular projections from the inside, was affixed with the help of strong glue (fevicol). One circular (8 cm diameter) and also a small rectangular (5x8 cm) window were cut with the help of a paper-knife. Additionally, a thin (10mm thick) and rectangular (8x12 cm) platform was also made below the outside of the circular window to facilitate bird perching (Fig. 4B).



A-available in market



B- fabricated from trash

Fig. 4 Bird House

Field Rearing Cages for Insects

Apart from laboratory rearing, field studies are also required in the case of insects (Golub *et al.*, 2012; Thamseer and Saini, 2020). For which, a good number of companies are in the market with different field cages at fairly high prices. These field cages available in scientific stores are simple square or rectangular tent-like structures having enough space to accommodate the host plant of a particular insect species (Fig. 5A).

Method of Fabrication

The discarded plastic water supply pipes and mosquito nets were used to fabricate the field-rearing cages. The plastic pipe was cut into equal sizes (60 cm) and fixed with each other to make a square-shaped tent-like structure. Later, the mosquito net was covered and sewn all over the square frame having one access door. This economically viable rearing cage can be efficiently used to cover plants inoculated with and without specific insect species either in earthen pots or directly covering the plants in agriculture fields under natural settings for various biological research studies (Fig. 5B).



A-available in market



B- fabricated from trash

Fig. 5 Field rearing cage

Light Trap

Light traps are widely employed to capture and control the arthropods active in the night (nocturnal) or attracted towards light viz., moths. Due nocturnal habit of some important insect pests, it is very difficult to capture them during the daytime. Light traps are also being used in monitoring the population dynamics of nocturnal insects (Golub *et al.*, 2012; Sheikh *et al.*, 2016). In these light traps, a light source is fixed over a bowl or container carrying some liquid to kill the captured insects (Fig. 6A).

Fabrication of light traps from trash

Plastic discarded oil containers from kitchens were cut on either side leaving thin arms supporting the top including the lid of the container. A small light bulb was fixed underneath the lid. After supplying electricity, the bottom pan was filled with water and kerosene. The light-loving insects approach the light source but cannot sit on it due to heat. Then they move blindly in all directions to sit but get trapped in a liquid-filled container (Fig. 6B).



A-available in market



B- fabricated from trash

Fig. 6 Light trap

Insect collection and display boxes

Insect collection and their preservation is an important practice of entomologists across the globe. It helps in creating insect museums, insect gene banks, and identification references for beginners. After collecting the insects through various techniques, the collected insects are subjected to dry storage in boxes. Generally, they are made up of wooden walls and bases with a capping of wooden or transparent glass. These boxes are called insect collection or display boxes and are easily available in academic markets with very high costs according to different sizes (Fig. 7A).

Method of Fabrication

We used fabric packaging material made up of cardboard sheets. These packaging boxes were further provided with a thermocol base to facilitate succulent plate form for placing and arranging pinned insect specimens. The top sheet of the box covering was removed and replaced with a transparent fiber sheet to provide an external view of the internally stored specimens (Fig. 7B).



A-available in market



B- fabricated from trash.

Fig. 7 Insect collection and display box

Aleytrap

This device is used to monitor the population count of small insects (e.g., whiteflies and jassids) and also to capture them in field crops in the natural environment. It is a square-shaped hollow device at the base and converting to trapezium at the top. The trapezium top holds a glass pan (Ahmad *et al.*, 2014). This device utilizes the phototaxis behavior of insects (Fig. 8A).

Method of Fabrication

Discarded acrylic sheets were collected from the house and further, cut into an inverted “V” shape. These pieces were fixed against each other in an inverted manner with the help of a glue gun that gave it a trapezium shape. The top of this trapezium was covered with a glass pane to facilitate an inside view. On the wall of this device, black paint was applied and handles were fixed to provide easy transportation from the lab to the field and vice versa. Laterally close to the neck region, one circular hole was made and a cloth sleeve was fixed on the edge of this hole to access the insect collected below the glass pane. This cage is

quite feasible for the collecting number of insects i.e., whiteflies, jassids, hoppers, and other small fast-flying insects (Fig. 8B).



A-available in science labs



B- fabricated from trash

Fig. 8 Aleytrap

Conclusion

The present work has explored the possibilities to utilize a variety of discarded and used materials viz., cardboard and thermocol-based packing material, building material, furniture items, acrylic and glass panes, cloths, pens, electrical items, etc, in making important laboratory tools of biological sciences. Such trash material was collected from municipal and house bins including door-to-door collection. The transformation and value addition to collected material is not very often. Several useful biological tools viz., aspirators, rearing cages for different types of insects, birdhouse, light trap, insect collection, and display box, aleytrap for collection and counting of soft-bodied insects (white flies and jassids in particular) were fabricated. Such artistically transformed tools from trash will enable students and young scholars to study insects and birds at home and also demonstrating practically in classrooms at schools and/or colleges. These tools are comparatively cheap to the products available in the market and will be economically feasible for students. Furthermore, this transformation will promote innovation and a culture of frugal living, therefore transcending simple financial savings. The ensuing "trash art" will create opportunities for entrepreneurship as well as useful tools for biological study. Training people especially those who come from economically underprivileged areas to artistically design and market these lab gadgets would help to generate money to support scientific research and also generate moderate employment. This twin advantage of encouraging creativity and offering financial support can open fresh doors and enable people to participate in the scientific community. This transformation ultimately shows how sustainability, science, and art may interact to enhance livelihood as well as research. Considering these facts, the trash conversion to artistically designed biological tools must be promoted on social media platforms to make it common practice among students and the rest of the academic world.

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