# Creative Edupreneurship: Creating Inexpensive Biology Teaching Resources, Schools Facilities from Waste Products for Science Education at a Reasonable Cost

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## Abstract

*This study investigates the conversion of waste materials into useful teaching materials and gardening tools in the interest of creative educational entrepreneurship. This study explores the possibilities of waste plastics, particularly PET, and waste paper in solving the lack of reasonably priced educational resources in schools. This study has produced useful products including watering cans, seedling shields, and instructive models by ingeniously utilizing PET plastics. Additionally, using paper mache techniques to turn waste paper into long-lasting and reasonably priced educational materials offers a sustainable substitute for pricey imported educational goods. In addition to giving educators the means to create necessary instructional resources, this waste-to-wealth strategy provides schools with a workable answer to their financial problems. By decreasing reliance on expensive imports and utilizing waste materials that are locally available, this effort highlights the advantages of both economic empowerment and environmental sustainability. In the end, this study shows how educational entrepreneurship can promote sustained economic growth as well as innovation in instructional strategies.*

**Keywords**: Waste to wealth, PET plastics, Paper mache, Instructional materials, Educational entrepreneurship, Sustainability, Economic empowerment.

## Introduction

Environmentalist has described Junks as the collection and assemblage of different compositions of waste materials (Golden Plains Shire Council, 2016) Waste as been describing to be domestic waste, industrial waste, chemical waste, biological waste, Agricultural waste and toxic and nontoxic waste, depending on the sources it is on those bases that it could be classified. There are many human activities throughout the world that may have a sufficient and significant impact on the environment, either negatively or positively, depending on how they are utilized, expressed, or exploited, as well as how they are managed. Because of the exponential population growth and the indiscriminate exploitation and use of the environment's natural resources, waste production and generation have been observed to have increased (Seik, 1997). Edupreneurship, which has a combined meaning of education and entrepreneurship, is a unity that cannot be separated from its meaning. The two become a single unit because the process reflects the concept of entrepreneurship education, which means educating someone to do and produce something of sale

value, and then it can be used by himself or a group. One of the efforts in preparing students to live and improvise with their environment is to apply character education. Many educators still have economic shortcomings, so not focusing on work becomes a problem. The income of educators is still below the minimum wage, which is undoubtedly significantly less than the world's fulfillment of life in this modern era. It makes the performance not optimal. The same thing can be achieved by making the teaching profession while becoming an edupreneurship so that income can increase to support the needs of family life in the modern era.

In the modern educational landscape, the scarcity of affordable instructional materials poses a significant challenge to effective teaching and learning. The escalating costs of imported educational products place a financial strain on schools, particularly in developing countries. In response to this issue, innovative educational entrepreneurship, or edupreneurship, emerges as a viable solution. By transforming waste materials, such as PET plastics and waste paper, into valuable instructional resources, this research aims to address the material needs of schools while promoting environmental sustainability and economic empowerment. This waste-to-wealth approach not only provides practical tools for educators but also fosters a culture of innovation and resourcefulness among students.

Plastics and paper waste constitute a significant portion of municipal solid waste (MSW) in many environments, including educational institutions. The continuous increase in plastic production, driven by rising human population and demand, has led to higher generation of plastic waste. Improper disposal of plastic waste, particularly Polyethylene Terephthalate (PET), poses serious environmental and public health risks due to the release of hazardous chemicals during open-air burning. Similarly, paper waste from student activities, such as marked test scripts, detached textbook materials, and personal notebooks, contributes to environmental degradation on campuses.

The educational sector faces the dual challenge of inadequate instructional materials and improper waste management. The high cost of foreign-made educational products has led to calls for improvisation and the use of locally available materials. This study explores the potential of upcycling waste plastics and paper into affordable, durable instructional materials and gardening equipment (Lukman, 2021). By leveraging the abundance of waste materials on campuses, this research aims to create a sustainable solution that benefits both educators and environmentalists.

**Problem Statement**

The accumulation of paper and plastic waste in educational institutions has become a significant environmental and operational challenge. In schools, paper waste is often generated in large quantities from various units, including the library, where obsolete and sensitive documents must be properly managed and disposed of. As the world transitions to digital formats such as PDFs and e-books, the traditional paper-based library is becoming obsolete, exacerbating the issue of paper waste disposal. This poses a considerable concern for school management, which must determine effective channels for managing these outdated documents.

Simultaneously, the cost of purchasing instructional materials, especially science-oriented teaching aids, remains prohibitively high. This issue is particularly acute in rural schools, which often lack even basic teaching aids. The economic downturn has further compounded this problem, as many educational technology suppliers have shut down due to low demand and increased raw material costs. Consequently, there is a pressing need for affordable, locally produced instructional materials.

Plastic waste, especially PET bottles from popular beverages consumed by students and faculty, also poses a major environmental challenge. Despite efforts by college administrations to provide waste disposal facilities, the improper disposal of these plastics continues to pollute school environments. The prolonged biophysical breakdown of plastics in the environment, particularly in aquatic settings, has detrimental effects on wildlife and contributes significantly to greenhouse gas emissions.

Moreover, the rising cost of construction materials, such as cement, has made building infrastructure, including student housing and relaxation hubs, increasingly expensive. Given the high consumption of PET bottled drinks on campuses like Kwara State College of Education in Ilorin, reusing these waste plastics to construct buildings and other structures presents a viable solution.

Therefore, this study aims to address these interconnected problems by exploring the transformation of waste materials into valuable instructional resources and construction materials. By leveraging locally sourced waste plastics and paper, this research seeks to provide sustainable and cost-effective solutions for schools, contributing to environmental sustainability and economic empowerment. This approach not only mitigates the environmental impact of waste but also equips

educators with affordable teaching aids, ultimately benefiting stakeholders in education, government, and environmental management.

**Objectives of the Study**

The primary aim of this research is to construct instructional materials from campus waste paper using paper mache technology and to develop an experimental student relaxation hub using waste PET plastic found around the campus. By adopting these innovative waste management approaches, this study seeks to provide sustainable and practical solutions for managing waste paper and plastic on educational campuses. Specifically, the study

i. Construct Instructional Materials from Waste Paper: Develop durable and cost-effective teaching aids for biology using paper mache technology from waste paper generated on campus.
ii. Find a Lasting Solution to Paper Waste Generation: Develop and implement strategies for managing and repurposing waste paper to reduce environmental impact and provide sustainable teaching materials.
iii. Construct a Student Relaxation Hub Using Waste PET Plastic: Design and build an experimental relaxation hub for students using waste PET plastic bottles collected from the campus.

By achieving these objectives, the study aims to contribute to environmental sustainability, reduce waste on campus, and provide affordable instructional materials and infrastructure solutions for educational institutions.

**Literature Review**

In literature, waste management involves the scientific, cultural, and technological approaches adopted for waste control and its disposal. Furthermore, waste management encompasses the conversion of waste into other useful materials and products that benefit society at large. The principle of waste management is often described by the acronym "3 Rs," which stands for reducing, reusing, and recycling. However, this study is grounded in the expanded theory of waste management proposed by the Golden Plains Shire Council, known as "The 7 R's of Recycling," which includes recycle, refuse, reduce, reuse, repair, re-gift, and recover. This research focuses specifically on the fourth 'R'-reuse-defined as finding new ways to utilize items that would otherwise be discarded.

A common understanding of waste is that it consists of unwanted by-products of human activities generated within the environment. Human life in modern society poses complex environmental challenges, including the need to manage the threats posed by waste generation. Effective waste management involves a series of activities, processes, and actions required to manage waste from its inception to its final disposal. This includes collection, transportation, treatment, and disposal, along with monitoring and regulation to minimize the adverse effects on human health, the environment, and aesthetics (Ivanova, D. et.al. 2016)

The focus of waste management in this study is on the reuse of waste paper and plastics rather than recycling. Recycling has been critiqued for merely extending the life of materials that may still end up as waste. In contrast, reusing waste paper through paper mache technology creates new products with permanent uses, thereby converting waste to wealth. Artistic activities that transform waste into valuable materials through art and technology contribute to this approach.

Education plays a critical role in developing individuals' intellectual capacities and social usefulness. Those who receive education are better equipped to handle complex problems and offer effective solutions. Education involves imparting knowledge, skills, and competencies necessary for successful participation in society, highlighting the need to improve the quality of education to produce citizens who can contribute positively to national development.

In educational contexts, improvisation refers to creating and utilizing local resources when genuine materials are unavailable. This involves using alternative materials and resources to facilitate teaching and learning. Instructional materials are crucial for effective teaching and learning, enhancing engagement, practicality, and appeal. They enable both teachers and students to participate actively and productively in the educational process, providing opportunities for learning and self-awareness.

Improvised instructional materials must be safe to use and hazard-free. They are especially effective in teaching biology and other science subjects at all educational levels. However, the high cost of procuring instructional materials often hinders their use in schools. Thus, improvisation using locally available raw materials, such as campus waste paper, offers a practical solution.

The Golden Plains Shire Council's waste management theory, "The 7 R's of Recycling," includes reuse as a key principle. Reuse involves finding new ways to use items that would otherwise be discarded.

Globally, plastic production was estimated at 380 million metric tons in 2018, with significant amounts of plastic waste accumulating in landfills and the natural environment. Most plastics do not biodegrade meaningfully, posing long-term environmental challenges. Recycling plastic involves reprocessing recovered plastic scraps or wastes into usable products. This is a crucial part of global efforts to reduce plastic waste entering the oceans, which amounts to 8 million tons annually (Golden Plains Shire Council, 2016.). Plastic recycling can be categorized into primary, secondary, tertiary, and quaternary recycling, each with different processes and outcomes (Golden Plains Shire Council, 2016.)

In summary, this literature review highlights the importance of innovative waste management approaches, particularly the reuse of waste paper and plastics. These approaches offer sustainable solutions for educational institutions, contributing to environmental sustainability and economic empowerment.

**How Does Recycling Work?**

Recycling is the act of taking spent resources and turning them into fresh ones that may be utilized to make new products. Items like cans, plastic, paper, and metal may fall under this category. Recycling has several advantages, including lowering pollution, conserving resources, and using less energy for long-distance transportation and mining.

After being sorted, recyclables are cut up into smaller pieces, processed, and transformed into fresh raw materials to create new products. However, it is frequently combined with new plastic because plastic is not as durable as it once was.

For paper, the same is true. New paper and recycled paper are regularly mixed together. This is due to the fact that compared to when it was first manufactured, recycled paper has lost a lot of its strength and purity. Recycling is still important since it reduces garbage disposal and is environmentally friendly in the long run.

**What is recyclable?**

In general, anything made of paper can be recycled, including office paper, cardboard, newspapers, and magazines. Additional recyclable materials include certain plastics, glass from bottles and containers, and metal from tin, aluminum, and steel cans. Just make sure they are clean and clear of pollutants like food. Concrete, steel, aluminum, plastics (including PET, PP, PBT, and PLA), textiles, wood, glass, and paper are materials that are frequently recycled.

When you recycle, your recyclables are picked up from your house, place of employment, or a recycling facility maintained by the local municipality. They are then transported to a recycling facility, where they are categorised.

This is carried out because various materials are recycled through various procedures. For instance, although paper and plastic cannot be recycled at all, aluminum and glass can.

**What Cannot Be Recycled?**

Although a lot of products can be recycled fairly easily, some items, unfortunately, can't. This is because they are either too contaminated or not made from materials that can be recycled cleanly for economic reasons.

Examples are plastics used for containing bathroom toiletry products eg. toothpaste or food packaging would require more energy and costs to recycle compared to the raw virgin material. Certain types of foam, such as polystyrene, are difficult and expensive to recycle since they are mostly air and frequently contaminated.

It is also difficult to recycle items that closely integrate mixed materials into their function or feature because it is difficult or time-consuming to separate. For example, dual-material products like glossy paperboard materials used to hold liquids or foods, prove difficult to separate, or mixed-plastic products since the plastics may require different processing.

**The Key Processes Involved In Recycling**

High recyclability is a term used to describe a material that can be rapidly recycled. It implies that the chemical and physical properties of the original material do not deteriorate significantly from those of virgin materials.

Recycling has been more of a way to reduce the environmental effect of waste than it has been a strategy for eliminating it.

The term "energy recovery" refers to the recycling process of recovering energy from waste materials by converting non-recyclable waste into thermal energy, electrical power, or fuel. It makes up the bulk of recycling processes worldwide.

Unfortunately, since it is frequently used to destroy waste items, it may produce harmful emissions, which need to be controlled, limited, and measured regularly.

The next most important aspect of recycling is the material recovery process. This is both an environmentally and economically beneficial effort, as raw materials that are readily available from natural resources are becoming increasingly difficult to find.

For example, aluminium is more readily accessed through secondary recycling processes than primary extraction methods.

**The Environmental Benefits of Recycling**

Recycling conserves natural resources like water, timber, and minerals by taking less energy to manufacture products from recycled materials than it does to make them from virgin materials.

Water is consumed in manufacturing most other products. For example, it takes 22 gallons of water to make one pound of plastic. In fact, it takes at least twice as much water to produce a plastic water bottle as the amount of water contained in the bottle.

There are reduced greenhouse gas emissions as it takes less energy expenditure to manufacture products from recycled materials than it does from new materials. This is because recycled materials are easier to process and don't require as much energy for raw virgin materials to be processed and reformed into new products.

Recycling is one way to help limit the amount of waste that goes into landfills brimming with mountains of waste. Most of this waste could be prevented if we were more careful about recycling. Just think, every time a tin can or a plastic bottle is recycled, it is one less item thrown into waste that ends up in landfills.

**What is Upcycling?**

Upcycling is the process of taking something that is no longer needed and transforming it into something new and useful. This can be done by repurposing or reusing.

You have a glass sauce jar on hand. You may wash it out and place it in the glass recycling bin to be recycled as materials in future manufacturing. If you wanted to upcycle or repurpose the jar, you could clean it out and use it as a desk tidy or make-up brush storage.

**What Can Be Upcycled?**

Upcycling is a creative process of finding new use or purpose in a previously discarded item. It involves taking an item that would otherwise be wasted and improving it in some way to make it useful again.

Old and outdated furniture is a popular upcycled "material". A cabinet or chest of drawers may be quickly and easily restored by sanding, painting, and adding new handles.

However, up cycling is more than just upgrading or renovating things into improved versions of themselves; objects are frequently repurposed to serve a completely different function.

Plastic bottles, for example, can be used to make a variety of items, including a face visor, a plant container, a watering can, fairy lights, and even a bird feeder.

Old jeans may be used to create back packs, tops can be woven together to make shopping bags or plant holders. It's also possible to turn a single dress into a two-piece garment.

**What Cannot Be Upcycled?**

There are limitations to items that can be upcycled despite the repurposing or any attempts at improvement and upgrades. Items which are damaged or broken beyond repair, have become dangerous to use, they contain hazardous materials eg. foam that is toxic when burnt.

When you are certain that an article in its current form cannot be used anymore and needs to be broken down and reformulated, then recycling is a better option. For instance, metals like copper and aluminium might bring more value being recycled than upcycled, sitting as a paperweight or art piece.

**Key Processes Involved in Upcycling**

Upcycling is reusing or re-purposing disposed of items, without processing them into their base state of component materials, to create a "new" product of a different function or improved value - commonly described as "creative reuse".

In comparison, recycling is the process of breaking down disposed of items or waste materials back into their "raw" materials state to create new products.

Upcycling, emphasizes the principle of "designing out waste" during the design of products, in preparation for future upcycling at the end of the product's lifetime.

Designing out waste can be done by designing products that can be easily assembled or disassembled and can incorporate future expansions if required. Specific measures should be taken to facilitate quicker and easier disassembly, repair, re-purposing, and reuse of the products.

Recycling involves the destruction of waste in order to create something new, whereas upcycling takes waste and creates something new from it in its current state.

When upcycling, the original form is retained and the object is recognisable, it can be seen what it has been and also what it has become.

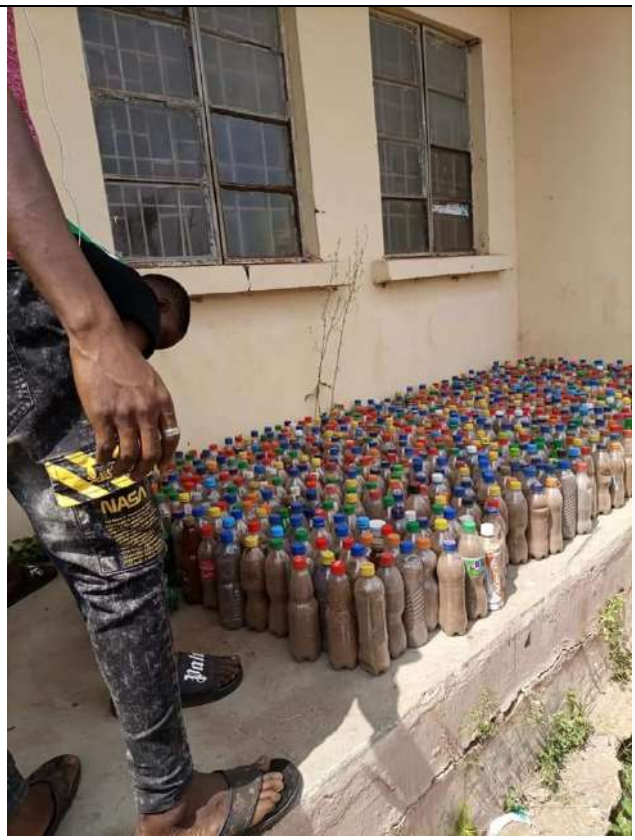
While recycling is practical, upcycling is highly creative and can involve a wide variety of techniques and materials to create the finished product.

**Materials and Methods**

| **Construct Instructional Materials from Waste Paper: Develop durable and cost-effective teaching aids for biology using** | **Construct a Student Relaxation Hub Using Waste PET Plastic: Design and build an experimental relaxation hub for students** |
|---|---|

| paper mache technology from waste paper generated on campus | using waste PET plastic bottles collected from the campus. |
|---|---|
| The methodology adopted for this was Up-cycling**.** Up-cycling is the process of reusing waste materials without breaking them down into their base state to create a product of higher value or quality<br>**Description of study area/site**<br><br>The study was conducted at the Kwara State College of Education, Ilorin. The school is located in the core of Ilorin metropolitan specifically; around the popular sawmill area, Geri Alimi axis, Umar Saro Road, Ilorin Kwara state.<br><br>The main subjects/materials that will be used in this study are waste papers<br><br>The procedures to be followed were breakdown into the following activities<br><br>Activity 1: **Identification of a biological diagram to be constructed with paper Marché**<br><br>There are concepts in biology that are difficult to teach as well as difficult to learn. Part of the reason why some topics are hard to teach and learn is because of irrelevant instruction materials that are sometimes used in the teaching of these topics by the teachers. Hence, it is at this stage that the researcher focuses his attention on the selection of basic biological concepts in the biology curriculum that are hard to teach and learn, as identified by teachers and students, as inadequate teaching aids to be used among other reasons. It was the aim of the researcher to add to the growing number of instructional materials that would be available to teach topics in these categories as different researcher recommendations advised.<br><br>Activity 2: **Collection of Waste Papers** | **Stage One**: Collection of waste plastic PET<br><br>**Stage Two**: Sorting of collected empty waste plastic PET bottles in to different sizes texture, colors and shapes<br><br>**Stage Three:** Removing of cellophane nylon on the collected empty waste plastic PET bottles<br><br>Stage Four: filling Empty Plastic PET bottle with sandy Soil (serving as bullet proof purpose)<br><br>**Stage Five:** Making Foundations<br><br>**Stage Six:** Making Roof framework<br><br>**Stage Seven:** waving Grasses to make the Roof<br><br>**Stage Eight:** underlying the grass roof with nylon to prevent water from entering during raining season<br><br>**Stage Nine:** Landscaping<br><br>**Stage Ten:** interior designing |

The research, in conjunction with some selected students, picked up all pieces of paper littering around the school halls, premises, and classrooms. Moreover, the researcher personally writes to the school management to request approval to purchase all waste papers in the care of the registry unit, bursary units, library section and examination units of each school, as well as the directorate of examinations and records. According to the researcher, these units harbor and keep old documents of students and staff, and they are constantly confronted with how to dispose of and safely keep them due to environmental factors such as termite attachment and the like.




*A total of 5–10 tons of waste papers are projected to be collected for use in this study.

**No ethical clearance was needed for this study** since the research work does not involve the use of human subjects.

Activity 3: **Sorting collected waste papers into different sizes, textures, and colors**

It is necessary to sort the collected paper along these criteria to achieve optimum usage of the papers.

Activity 4: **Removing cellophane nylon from the collected waste papers that are laminated**

It is important to remove the nylon film used in laminating some of these waste papers before soaking so as to prevent the nylon from not allowing them to glue together when adhesive materials are added, as described by Marché.

Activities 5: **Soaking of Collected Waste Papers**

The collected paper needed to be soaked with water in different containers due to its various

colors and textures. This mixture will be left for 24 hours to allow fermentation to take place.

Activities 6: **Pounding of the soaked waste papers**

The socked papers will be pounded with the use of mortal and pistil. This is to soften the papers in preparation for a march

.

Activities 7: **Mixing with adhesive**

At this stage, the pounded papers will be mixed together with starch and top-bound. This will allow the particles to glue together while being used to mold any models of choice.

Activities 8**: Sketching the model on a plank**

The chosen biological concept diagram to be molded with waste paper will be sketched on a plain plank surface. This is used to guide and direct the creation of the mold.

Activity 9**: Building and Constructing**

At this stage, the pounded paper that has turned into paper Mache after the addition of adhesive during the socking process was be used in the

construction of the chosen instructional materials.

Activity 10**: Finishing, Labeling, Automation, and Branding**

This is the final stage where finishing touches will be put on the instructional materials produced so that they will measure up and serve the purpose they were designed to do.

Biological diagrams contain labels; it is at this stage that proper labeling will be done to confirm compliance with the acceptable standing rules guiding the diagram illustration in biology.

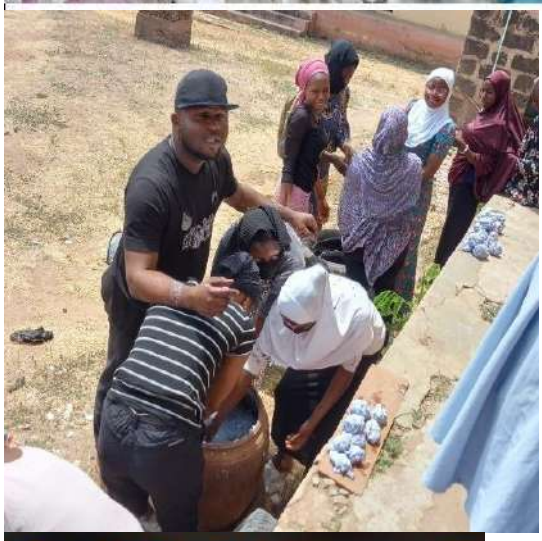
lastly, the produced instructional materials carry the name of the researcher's institution and **Tertiary Education Trust Fund (TETFUND) as the sponsor.**

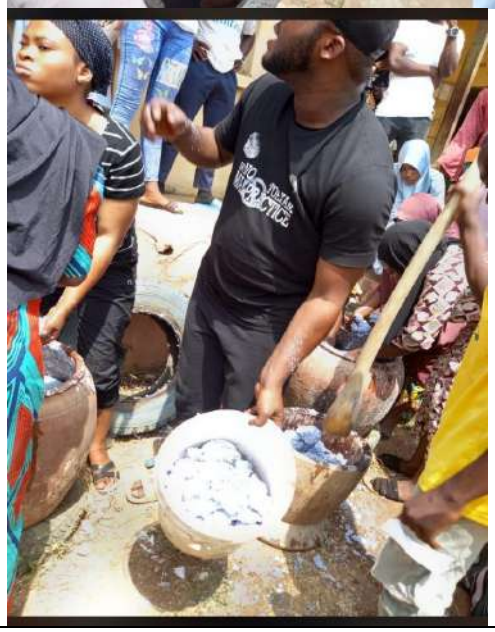
Activity 11**: Data Analysis**
No primary or secondary data is expected to be collected and none was collected

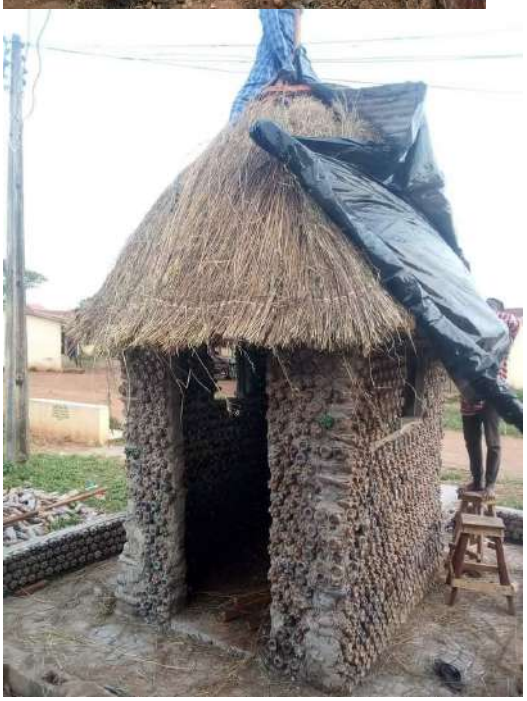
Where data is needed to be analyzed, Descriptive statistics such as ration, frequency and percentages and Pictorial representation of data such as pie chart, histogram was used to present the data analysis where required. Areas where these will be carried out include;

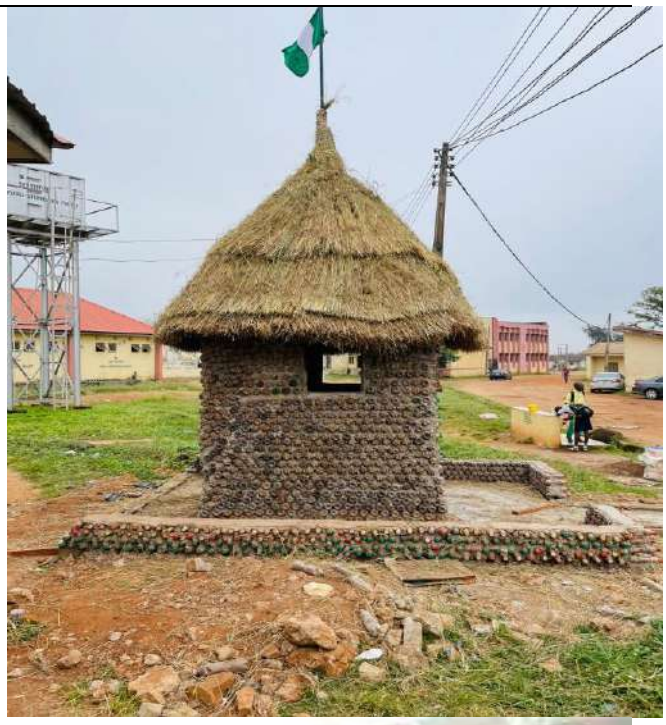
- Total grams of waste paper picked
- Ratio of waste paper to water used
- Ratio of Waste paper and adhesive used

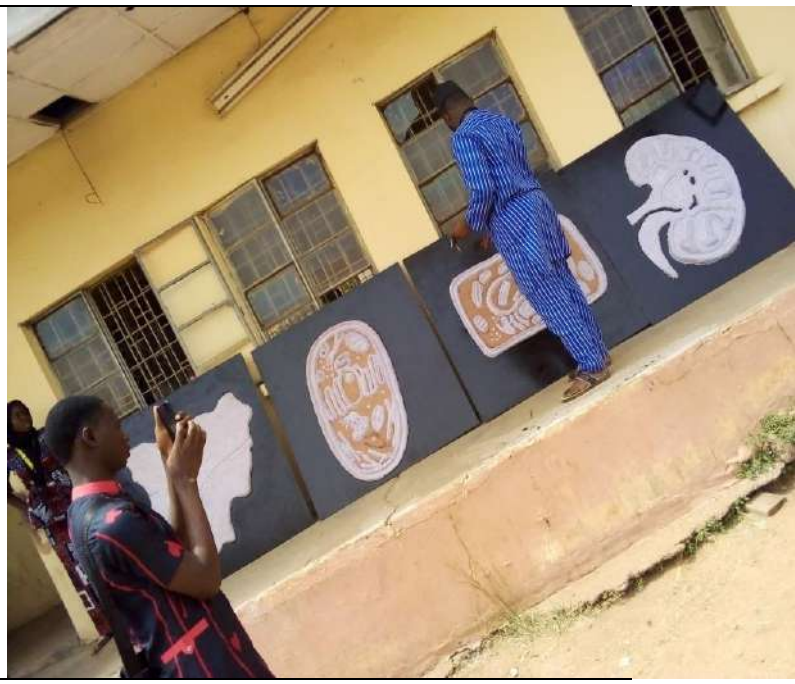

INTEGRATED
SCIENCE











**Results (Expected outputs/Results)**: At the conclusion of the above activities, a beautiful locally made improvised instructional materials (See Appendix I) that can be used to teach, difficult to teach, and difficult to learn selected biology concepts in schools.

Since the purpose of the study is to develop improvised instructional materials for the teaching of selected concepts in biology, the result of this study will provide a good substitute for foreign synthetic and expensive instructional materials that most schools in Nigeria patronize at a high cost.

Enough tons of waste paper would be collected around the college campus, leading to a clean and eco-friendly campus environment.

Lastly, to be precise, a model of the human kidney, heart, lung, and skeletal system will be produced from campus waste paper and made available for school use.

As for plastic upcyline, Waste to wealth: a carefully curated collection of waste plastics (PET) is used to construct a mini relaxation hub inside the Kwara State College of Education, Ilorin, Nigeria. The addition of sandy soil filled inside the waste plastic PET makes it bulletproof and therefore could be used to construct a community security post as recommended below. This discovery of filling the waste plastic PET with sandy soil makes the research worthwhile and apt,

since Nigeria, among other nations, is currently facing serious security challenges. Security agencies have tested and confirmed it, as seen at major military checkpoints along Nigerian roads where sandbags were parked inside empty sacs to form barricades and also served as bulletproof as applicable to the aforementioned discovery. This has expanded the secondary functions of waste plastic PET, which can also be used to construct security posts and community vigilante security posts, among others.

The aesthetic scene that the construction from waste plastic PET created added to the beauty of the campus when it was completed. The construction of the mini-relaxation students' hub created a beautiful scene in the area inside the campus where the building was located; students were occasionally seen taking group and personal pictures using the waste plastic PET building background because it is not a regular building student see in their various communities.

The first stage in the rendition of waste materials is the collection of waste plastic PET junk, followed by the collection of empty plastic PET bottles, the sorting of the collected empty waste plastic PET bottles into different sizes, textures, colors, and shapes, and the removal of the cellophane nylon from the collected empty waste plastic PET bottles (Dahlman, 2007). The remaining stages include the collection of sawdust and sand, the mixing stage, making foundations, building, and constructing.

## Conclusion

The three "Rs" of waste management recycling, reusing, and reducing should not prioritize recycling as the first option. Environmental waste management can be achieved through diverse processes by various platforms, including individuals, corporate organizations, researchers, non-governmental organizations, the government, and community efforts. This study emphasizes the importance of exploring secondary uses of waste generated from domestic consumption rather than recycling, which is commonly practiced in many parts of Nigeria. Reusing campus waste paper presents a more environmentally friendly and cost-effective method of waste paper management by giving the paper a second life, albeit in a completely new form.

Creating teaching tools from waste paper, to be used in practical classroom activities, is a sustainable approach to waste management. This method transforms trash into valuable resources, promoting a secure and sustainable environment. The primary goal of educational resource

creation is to enhance teaching and learning, not merely to use instructional tools as decorations in classrooms or exhibits at national exhibitions, but to actively integrate them into educational processes.

**Recommendations**

Environmental waste management can be achieved through diverse processes by different platforms, including individuals, corporate organizations, researchers, non-governmental organizations, the government, and community efforts. This study underscores the need to focus on the secondary uses of waste generated from domestic consumption rather than recycling, as commonly practiced in many parts of Africa, including Nigeria. Recycling often targets producing the same materials in their second life, whereas reusing waste materials can create new, valuable products.

Reusing waste PET plastic is a more eco-friendly and cost-effective method of waste management. By giving plastic a second life in new forms, such as constructing a student mini relaxation hub, recreational garden, security duty post, animal cage, or pet house, we can convert waste into wealth and create a sustainable environment.

**1. Embrace Waste Paper Reuse:**

The administration of Kwara State College of Education, Ilorin, the Kwara state government, the federal government of Nigeria, and other governments worldwide should encourage the reuse of waste paper. This can involve using waste paper as raw material for creating improvised teaching aids and other applications within schools.

**2. Local Construction of Teaching Aids:**

Instead of importing instructional materials, locally constructed teaching aids should be made using methodologies similar to those adopted in this study. This will make the materials more accessible and relatable for students and teachers, and the low cost of production will be more budget-friendly.

**3. Student Involvement:**

Involve students in the construction of teaching aids. This participation will enhance their psychomotor skills and foster creativity, benefiting their future endeavors.

**4. Support and Patronize Reuse Initiatives**

The management of Kwara State College of Education, Ilorin, along with state and federal governments, should embrace and support the reuse of waste materials. This includes patronizing locally made instructional materials to reduce costs and promote sustainability.

**5. Embrace Waste PET Reuse**

The management of Kwara State College of Education, Ilorin, the Kwara state government, the federal government of Nigeria, and other governments worldwide should embrace and support the reuse of waste PET plastic bottles. This can include using these bottles as an alternative to building blocks for constructing recreational facilities and other outlined uses.

**6. Promote Reuse Initiatives**

Encourage and appreciate the efforts to reuse waste PET bottles within educational institutions and communities. This will foster a culture of sustainability and innovation in waste management.

By adopting these recommendations, educational institutions and governments can promote sustainable waste management practices, reduce environmental pollution, and enhance educational resources through innovative reuse initiatives.

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