SOURCING MATERIALS FOR DESIGN CHALLENGES

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RECYCLABLE MATERIALS

Recyclable materials are items or substances that can be collected, processed, and turned into new products after they have been used. These materials are saved from being thrown away and instead are reused to make something new.
Recycling helps protect our environment, saves energy, and reduces pollution.

Types of recyclable materials

1. Plastic materials
2. Wood and natural materials
3. Paper and cardboard
4. Metal components
5. Fabric

BUILDING MATERIALS

These are the items and substances we use to construct and create things.

Sample properties/characteristics of Building Materials

- Have the ability to withstand forces without breaking or deforming.
- Have the ability to resist wear, decay, and damage over time. Building materials are durable

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- ❖ Have the ability of a material to bend or be shaped without breaking. They are flexible.
- ❖ They are lightweight and easy to work with.

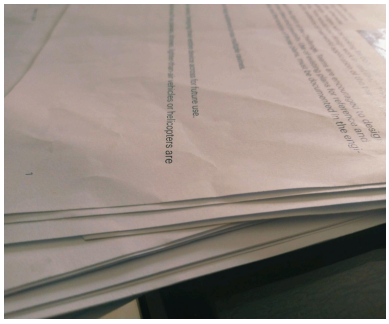
(a) Man-made building materials

Foam Board

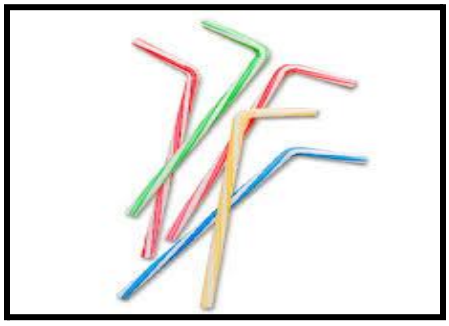
Metal (Tin cans)

Plastic bottles

Cardboard



Paper



Plastic milk Straws

Glass Bottles

Glass jars

Workshop wood remains

Food Cans

Beer Cans

Shoe Polish cans

Soda Straws

Plastic food containers

Plastic Containers

Ice cream sticks

Toothpicks

Plastic Tubes

Old used pens

Scrap Metals

Magazine

(b)Natural building materials

Banana leaves

Clay

Wood

Bamboo sticks

Sticks

Facilitative Questions

1. Where can we find building materials to make a tall structure like a building?
2. What properties would a material need to be part of a tall building?

3. How can natural and man made materials be used together to make a moving device?

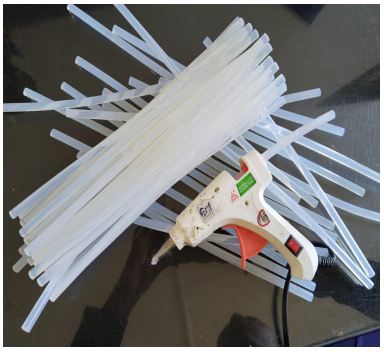
Connectors

These are materials or tools used to join different elements together.

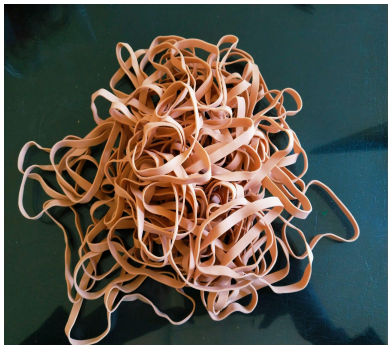
<u>Sample properties/characteristics of connectors</u>

- Have the ability to hold the materials together firmly.
- Have the ability to bend or flex without breaking.
- Have the ability to withstand wear, pressure, or damage over time. They are resistant to environmental factors like moisture, heat and UV light.
- They are easy to use, disassemble or adjust.
- Have the ability to work with different types of materials.

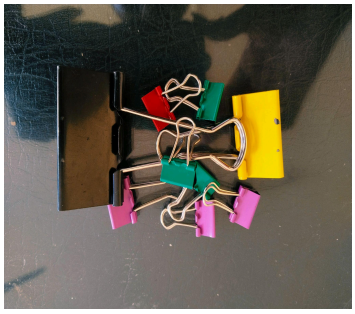
Yarn



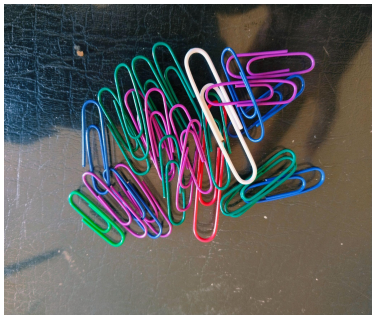
Glue sticks



Rubber Bands



Binder clips



Paper clips

Thread

Magnets

Pegs

Push Pins

Safety Pins

Strip of old cloth

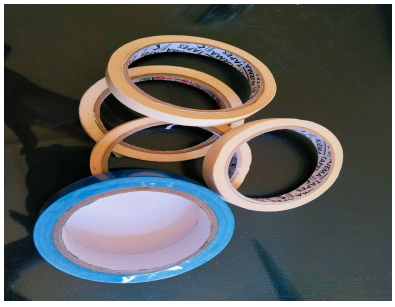
Brass Fasteners

Old Shoelaces

Ropes

Twist Ties

Staples



Tapes

Glue

N/B: Tapes and Glue are not easy to disassemble hence encourage minimal usage.

How to Make Basic Flour and Water Glue

This is one of the simplest types of glue to make, using ingredients that are likely already in your kitchen.

Ingredients:

- 1/2 cup of flour
- 1/2 cup of water
- A pinch of salt (optional, to prevent mold)

Instructions:

1. **Mix Ingredients:** In a bowl, combine the flour and water. Stir until the mixture is smooth and free of lumps.
2. **Heat (Optional):** For a stronger glue, heat the mixture on the stove over low heat, stirring constantly until it thickens to the consistency of paste.
3. **Cool:** Remove from heat and let it cool before using.
4. **Store:** Store the glue in an airtight container. If you add salt, it will last longer.

Other Examples

- Zipper
- Nails

Facilitative Questions

1. In what ways are connectors primarily used?
2. What can you consider when selecting connectors?
3. How will environmental factors (e.g moisture, heat) affect the connector's performance?
4. How do connectors contribute to the overall appearance of your project?

Flexible Materials

These are materials that can bend, fold or twist without breaking.

<u>Sample properties/characteristics of Flexible Materials</u>

- ❖ Have the ability to bend without breaking or cracking.
- ❖ Have the capacity to stretch and return to the original shape.
- ❖ Have the ability to be shaped or molded easily.
- ❖ They are compatible with other materials.

Balloons

Fabric(old cloths)

Plastic Bags

Nylons

Manila paper

Cotton

Newspaper/Magazine

Sponge

Aluminium foil

Soft Mattress

Wires

Plastic wire mesh

Springs

Springs can be found in:

1. Old Pens(ball point pens)
2. Clothespins (Peg Springs)
3. Broken Toys
4. Old Mattresses
5. Watches and Clocks
6. Household Appliance
7. Garage or Hardware Tools
8. Discarded Electronics

Facilitative Questions

1. In what situations would flexible materials be preferred over rigid materials?
2. What are some common examples of flexible materials used in crafting?

Round Materials

These are objects or components that have a circular or cylindrical shape.

<u>Sample properties/characteristics of Round Materials</u>

- ❖ Ability to support a structural craft.
- ❖ Have a shape that allows smooth movement.
- ❖ Variety of Sizes adaptable to various scales of crafting projects.

CDs

Bottle Caps

Coins

Plastic Lids

Cardboard tubes

Toilet Paper Rolls

Jar Lids

Bottle Corks

Plastic Circular food container

Old Buttons

Yoghurt Cups

Recycled tires

<u>Facilitative questions</u>

1.What are some common examples of round materials used in crafting and construction?
2.How does the round shape affect the way a material can be used in a project?
3.Why might round materials be chosen over other shapes for certain projects?

Structural Materials

These are materials with surface area.
They are used to support loads and provide stability to structures.

<u>Sample properties/characteristics of structural Materials</u>

- ❖ Have the ability to withstand pulling or stretching forces without breaking.
- ❖ Workability-The ease with which a material can be cut, shaped, joined, and finished

Cardboard boxes

Juice boxes

Milk cartons

Other Examples
Plastic bottles
Plastic Containers
Plastic lids
Paper
Glass
Fabric
Form board e.t.c

Facilitative questions

1. What are structural materials, and why are they important in crafting and construction?
2. How does the strength of a structural material affect the overall stability of a device?
3. What are some common examples of structural materials used in crafting and building?

TIPS TO HELP FIND RECYCLABLE MATERIALS

1. Household items. Look around your home for items that can be reused e.g cardboard boxes,toilet paper rolls, plastic containers, fabric etc.
2. School surrounding. Ask for items that are no longer in use e.g old binders and other materials.
3. Nature. Collect natural materials from outdoor spaces e.g leaves.
4. Construction site. Collect materials such as boxes, wires, wood, nails, ropes, etc.
5. Public places and roadside areas.
6. Business and retail stores e.g electronic stores can have old devices and grocery stores can have plastic bags and cardboards.
7. Events and festivals. Large gatherings often have recyclable materials e.g water bottles etc.
8. Scrap yards. These are great places to find recyclable metals and other materials.

SAFETY MEASURES WHEN COLLECTING RECYCLABLE MATERIALS

1. Wear protective gear i.e gloves and closed shoes to prevent yourself from sharp objects and hazardous materials.
2. Be cautious with glass, metal and other sharp objects to avoid cuts and punctures.
3. Stay away from materials like batteries, chemicals, medical waste and broken glasses. They can be dangerous.
4. Thoroughly clean materials collected. Rinse out containers to remove food residue to reduce the risk of contamination.
5. Use proper lifting techniques to avoid injuries.
6. Stay visible when collecting materials in public or roadside areas i.e wear bright, reflective clothing such as reflectors to stay visible to drivers.
7. Wash your hands thoroughly after handling recyclables, especially before eating and touching your face.
8. Drink plenty of water to stay hydrated.

FAQs For Teachers

1. How do I help my students explore material properties?
   - Allow students to test different materials for properties like strengths, flexibility, texture, shape, weight, color.
   - Engage students in discussions about the uses of different materials in everyday life and why certain properties make them suitable for specific purposes.

2. How can I organize a class-wide material collection effort?
   - Set up designated collection bins in the classroom or school, labeled for different types of materials.
   - Hold regular check-ins to ensure everyone is contributing.

3. What should students do if they can't find specific materials?
   - Encourage creativity by suggesting alternative materials that could serve a similar purpose.
   - If specific materials are required, consider reaching out to local businesses or recycling centers for donations.

4. How can I help students select the best recyclable materials for their projects?
   - Encourage students to think about properties of different materials (e.g flexibility, weight e.t.c) and how these will affect their project.
   - Discuss the pros and cons of each material in relation to the challenge goals.

5. How can I help students stay organized during the collection process?
   - Provide students with a checklist of needed materials and a track sheet of materials collected.
   - Encourage them to group materials by type or project use and store them in labeled containers or bags.

6. How can I ensure students take responsibility for the materials they collect?
   - Discuss the importance of responsibility and respect for shared resources.
   - Set expectations for how materials should be treated, stored, and used.

7. How can I encourage collaboration and teamwork during the tech challenge?
    - Assign roles within teams based on students' strength.
    - Encourage open communication, and hold regular check-ins to monitor progress.
    - Promote a collaborative environment where ideas are shared and built upon.

8. How do I teach students to properly clean and prepare materials for the challenge?
    - Demonstrate how to rinse out containers, remove labels, and safely cut or reshape materials.
    - Emphasize the importance of hygiene and safety when handling recyclables items, especially if they previously held food or liquids.

9. How do I address any challenges that arise during material collection?
    - Encourage open communication, teamwork and problem solving as part of the learning experience.
    - The challenges might be as a result of difficulty in finding materials or conflicts over resources.