

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.

(A) Types of recyclable materials

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

(B) Instrument and devices that may be bought and used

1. TOOLS

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.



**The Tech
Challenge**

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- ❖ Have the ability to resist wear, decay, and damage over time. Building materials are durable
- ❖ 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



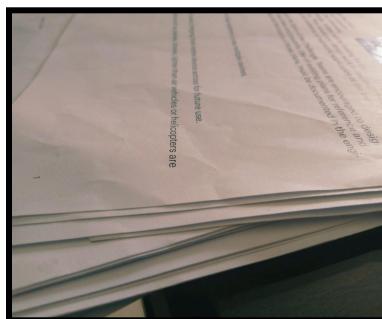
Metal (Tin cans)



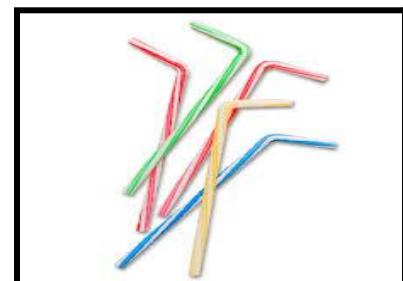
Plastic bottles



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



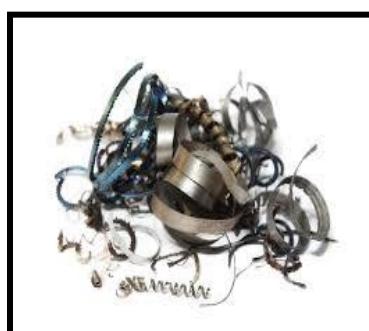
Toothpicks



Plastic Tubes



Old used pens



Scrap Metals



Magazines

(b) Natural building materials



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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.

Sample properties/characteristics of connectors

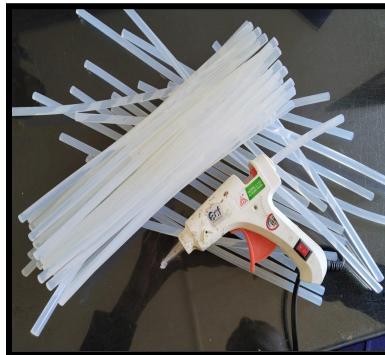
- ❖ Have the ability to hold the materials together firmly.
- ❖ Have the ability to bend or flex without breaking.



- ❖ 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.



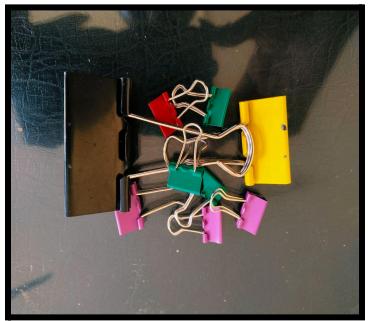
Yarn



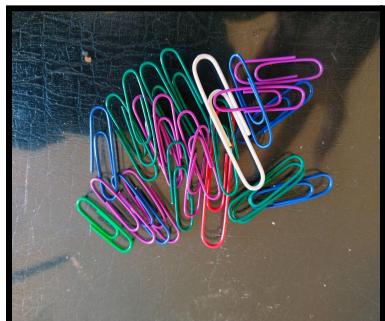
Glue sticks



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.



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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.

Sample properties/characteristics of Flexible Materials

- ❖ 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



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.

Sample properties/characteristics of Round Materials

- ❖ 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

Facilitative questions

- 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.

Sample properties/characteristics of structural Materials

- ❖ 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

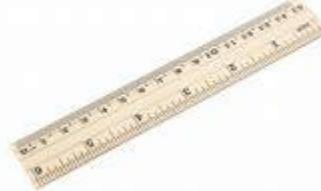
TOOLS

These are instruments or devices designed to perform specific tasks or functions. They can range from simple handheld objects to complex machinery, software, or systems. Here's a

Examples of such Tools

1. Screw driver
2. Pliers
3. Scissors
4. Box cutters
5. Glue guns
6. Hammer
7. Hole puncher
8. Rulers
9. Measuring tape



 <p>Screwdriver</p>	 <p>Pliers</p>	 <p>Measuring tape</p>
 <p>Scissors</p>	 <p>Box cutter</p>	 <p>Glue guns</p>
 <p>Hammer</p>	 <p>Hole puncher</p>	 <p>Ruler</p>

SAFETY TIPS WHEN USING TOOLS

1. Wear the Right Protective Gear



2. Inspect Tools Before Use
3. Wear Proper Personal Protective Equipment (PPE)
4. Avoid Distractions while using sharp tools or hammering tools
5. Training and Supervision when using electric power tools

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?

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.



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Look for these types of material

1. **Has to be light, not heavy** (because of weight limit)
2. **Flexible materials will work well too** (because of it having to fit in the bag)
3. **Connector materials** (to enable connection of different parts of protective structure to be whole)
4. **Materials with surface area** (something that can block or prevent strong winds from reaching the cubes)

Remember: Purchased components may be part of your device. Purchased kits are not allowed

EXAMPLE OF SUCH MATERIALS

1. Light materials

- Paper/newspaper/ printing papers/magazines
- Plastic bags
- Foams
- Sponges
- Boxes
- Leaves
- Fabric

2. Flexible materials

- Rubber
- Paper
- Straws
- Aluminum foil
- Copper foil
- Cotton
- Leather

3. Connector materials

- Binder clips/pegs
- Zip ties
- Rubber bands
- Glue/Glue sticks
- String/yarns/ropes
- Masking tapes

4. Materials with surface area

- Sponges
- Foam sheets



- Boxes
- Plastic bags and paper bags
- Fabric
- Wide leaves

We encourage students to use recyclable materials because they are free, easily accessible and available and by doing so we keep our environment. To get enough recyclable materials to work on one needs to collect them below are places one could find such materials

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.

Places to get Recyclable Materials

1. At home from daily day items like empty bottles of water cooking oil or containers old clothes empty boxes of device
2. At local shops near the leaving area like soda shops you will find straws and bottle top lids, boxes among many things
3. Construction sites ,electronic shops and mechanics shop and carpenters workshops you could get old electronics wires magnet wood nails
4. School areas one can get like papers boxes sticks pens leaves etc

CLEAN AND SAFETY PROTOCOLS

1. Collecting Recyclable Materials

- **Know what is recyclable:** paper, cardboard, plastic bottles, glass jars, metal cans, etc.
- **Use separate bags or bins:** keep recyclables apart from regular trash.
- **Pick from safe locations only:** school recycling bins, home, classroom, or supervised clean-up areas.
- **Avoid dangerous items:** broken glass, sharp metal, medical waste, or anything with chemicals.
- **Wear protective gear:** gloves, closed shoes, and maybe a mask if dust is present.



2. Cleaning the Recyclables

- **Empty containers first:** pour out leftover liquids or food.
- **Rinse with water:** wash bottles, cans, and jars to remove dirt and smell.
- **Wipe paper/cardboard if needed:** but do not soak them—wet paper cannot be recycled.
- **Let items dry:** drying helps prevent mold and keeps the recycling cleaner.

3. Watching Their Safety

- **Wear gloves:** to protect from germs, sharp edges, and dirt.
- **Have adult supervision:** especially when collecting in outdoor or public areas.
- **Do not touch hazardous items:** batteries, broken glass, sharp metal, chemicals—report them instead.
- **Avoid putting your hands near your face:** until you wash your hands.
- **Wash hands thoroughly:** after handling recyclables.
- **Lift objects carefully:** avoid lifting heavy bags alone.

4. Storing the Recyclables Safely

- **Use clean bins or bags:** label them clearly.
- **Keep the area dry:** moisture can damage paper and cause bacteria growth.
- **Do not overfill bags:** heavy bags can tear or cause injuries.

