May

Sustainable Product Design

This month focuses on designing practical and sustainable alternatives to everyday products. Students create solutions that reduce environmental impact while being functional and efficient. They learn how thoughtful design can influence sustainable living.

ACTIVITY 1: FOLDABLE REUSABLE SHOPPING CARRIER

Materials Needed:

- Thick fabric scraps or recycled tarp material (~50cm x 50cm)
- Needle and thread or Hot glue gun
- Cardboard templates for pattern cutting
- Measuring tape, scissors
- Markers for labelling

LEVEL 1 – DESIGN & FABRICATION

STEP-BY-STEP INSTRUCTIONS:

PART 1: UNDERSTANDING THE PROBLEM (5–10 MINUTES)

Step 1: Estimate Plastic Bag Usage

- **Ask 3–5 people (family/classmates):**

"How many plastic bags do you use in a week?"

- **Calculate:**

Weekly average × 4 = monthly usage per family

Example:

5 bags/week x 4 = 20 bags/month

PART 2: DESIGN EXPLORATION

Step 2: Create 3 Design Ideas

In your notebook, draw 3 different bag designs:

- Design A: Simple tote
- Design B: Foldable compact bag
- Design C: Reinforced heavy-load bag

For each design, think about:

- Durability – Will it carry weight?
- Foldability – Can it be stored easily?
- Material efficiency – Does it use less fabric?

Step 3: Select the Best Design

Choose one design based on:

- Strong enough for daily use
- Easy to carry/store
- Uses minimum material

PART 3: MAKING THE BAG

Components Needed

- Fabric piece (~50 cm × 50 cm) OR old cloth/tarp
- Needle & thread OR glue
- Scissors
- Marker

Step 4: Cut the Fabric

- Mark your design directly on the fabric using a marker
- Cut:

1. Main body
2. Handles/strips

(Tip: Keep extra fabric for reinforcement)

Step 5: Assemble the Bag

- Join edges using:
  Stitching (preferred) OR glue
- Attach handles securely

Important: Reinforcement

- Double-layer the handle area
- Add extra stitching or glue at stress points

PART 4: TESTING

Step 6: Strength Test

- Place items inside (books/water bottles)
- Check if it can hold at least 2 kg
- Observe:

1. Any tearing?
2. Weak points?

PART 5: IMPACT THINKING

Step 7: Calculate Impact

If 1 family uses ~20 plastic bags/month:

- 11 year = 240 bags
- 100 families = 24,000 plastic bags saved/year

VIDEO LINK 1: 6 TYPES OF REUSABLE BAGS

ACTIVITY 2: SOLAR-PASSIVE MODEL: HEAT COMPARISON BOX

Materials Needed:

- 2 identical cardboard boxes (shoebox size)
- Aluminium foil
- Black Paint
- LM35 temperature sensor x 2
- Arduino Uno
- 16x2 LCD display (12C)
- Jumper wires, USB cable

PART 1: PREPARE THE BOXES

Components Needed

- 2 identical cardboard boxes (shoebox size)
- Black paint or black paper
- Aluminium foil
- Glue/tape
- Cutter/scissors

Step 1: Modify the Boxes

- Box A (Heat Absorbing):
  Paint the inside black OR line it with black paper
- Box B (Heat Reflecting):

oLine the inside with aluminium foil (shiny side outward)

Step 2: Create Sensor Openings

- Cut a small hole (just enough for a sensor) in each box
- Place hole on the side wall, not top (to avoid direct sunlight hitting the sensor)

PART 2: SENSOR SETUP

Components Needed

- Arduino Uno
- LM35 temperature sensors × 2
- Jumper wires
- LCD display (I2C)
- Breadboard

Step 3: Understand LM35 Pins

Each LM35 has 3 pins:

- Left → VCC (5V)
- Middle → Output (Signal)
- Right → GND

Step 4: Connect Sensors

- Sensor in Box A → Signal to A0
- Sensor in Box B → Signal to A1
- Both sensors:

1. VCC → 5V
2. GND → GND

Step 5: Connect LCD (I2C)

- VCC → 5V
- GND → GND
- SDA → Arduino A4
- SCL → Arduino A5

PART 3: SENSOR SETUP

Step 6: Use This Code

- Upload the code to connect all the components together and display the sensor values on the LCD

PART 4: TESTING THE SETUP

Step 7: Place Sensors

- Insert one LM35 inside each box
- Ensure sensors are:
- Not touching walls directly
- Suspended or centered for accurate reading

Step 8: Sunlight Exposure

- Place both boxes in direct sunlight
- Keep them side by side

Step 9: Record Data

- Note temperatures every 3 minutes for 15 minutes
- Create a simple table in your notebook with Time (in min), Box A (Black), Box B (Foil)

PART 5: ANALYSIS

Step 10: Compare Results

- Which box heated up more?
- Which stayed cooler?
- How fast did temperatures rise?

PART 6: REFLECTION

Step 11: Apply Learning ; Think and write

Which design is better for:

a. Hot climates?

b. Keeping buildings cool?

What real-life examples match this?

a. White roofs

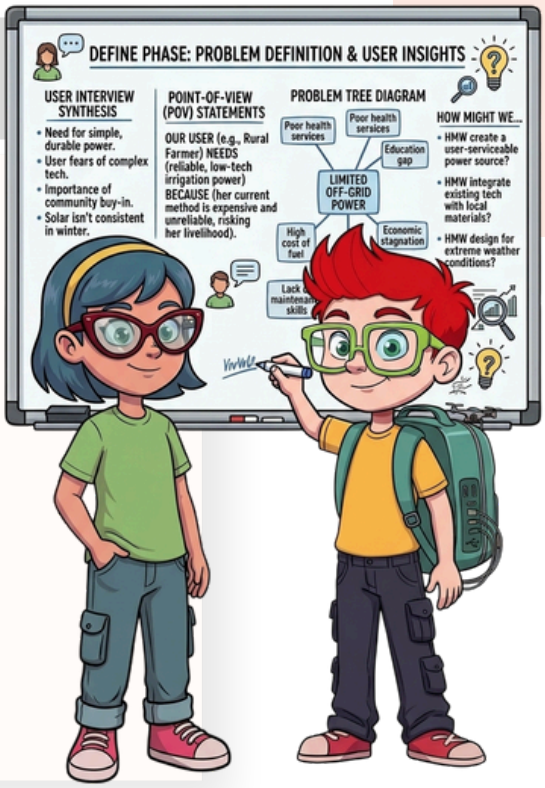
b. Reflective coatings

c. Insulated buildings

VIDEO LINK 1:DO DIFFERENT COLORS ABSORB HEAT BETTER

VIDEO LINK 2: HOW TO USE LM35 TEMPERATURE SENSOR WITH ARDUINO

DESIGN THINKING MISSION: DEFINE THE PROBLEM



THE CHALLENGE:

Your monthly mission: Convert your observations into a clear, specific, and evidence-backed problem statement.

You have already explored the problem in April. Now your task is to make sense of what you saw, identify the root cause, and define the problem precisely.

This stage is about clarity, not creativity.

A well-defined problem leads to powerful solutions.

WHAT TO SUBMIT:

Problem Statement:

Write a clear problem statement by describing what you observed, who it affects, the root cause, and the resulting impact or consequences.

Supporting Evidence:

Record at least three key observations or data points from April, including numbers or estimates wherever possible (such as counts or frequency).

Root Cause Analysis:

Conduct a simple "Why-Why Analysis" (at least 3 levels deep) Example:

- **Why is this happening?**
- **Why does that happen?**
- **What is the deeper reason?**

User Persona

Create a simple profile of one affected user:
Who are they?
What do they experience?
What challenges do they face because of this problem?

Step	What to Do	How to Do it	Output
1	Review April Data	Read all observations, photos, interviews	Key evidence
2	Select Key Insights	Choose 3 strongest observations/data points	Evidence list

Step	What to Do	How to Do it	Output
3	Identify Root Cause	Ask “Why?” repeatedly (at least 3 levels deep)	Root cause chain
4	Map Cause → Effect	Link root cause to real-world impact	Cause-effect understanding
5	Create Problem Statement	Use structure: We observed... This affects... Because... As a result...	Final statement
6	Validate with Evidence	Check: is every part backed by real data?	Refined statement
7	Create User Persona	Define 1 user: who, what they face, challenges	Persona card
8	Check Scope	Ensure problem is not too broad or too narrow	Finalized problem
9	Peer Review	Share with teacher/team → refine wording	Improved version

Judging Criteria:

- Problem Clarity (30%) — Is the problem specific, focused, and well-articulated?
- Evidence-to-Problem Link (20%) — Is the problem grounded in real observations/data?
- Depth of Root Cause (20%) — Does the team go beyond surface-level reasoning?
- User Understanding (15%) — Is the persona realistic and insightful?
- Problem Framing (15%) — Is the scope clear and neither too broad nor too narrow?