

SEPTEMBER

Circular Economy & Waste Innovation

This month focuses on understanding waste and how materials can be reused or recycled. Students explore solutions for managing and sorting waste more efficiently. They learn how circular systems can reduce environmental impact and promote sustainability.

ACTIVITY 1: SMART COMPOST MONITORING BOX



Materials Needed:

- Soil moisture sensor (FC-28) × 1
- DHT22 humidity + temperature sensor
- Arduino Uno
- Active buzzer
- RGB LED OR 3 LEDs (R/G/B)
- Small cardboard or wooden box (~30cm × 20cm)
- Jumper wires, breadboard

LEVEL 2 – SENSORS + MULTI-SENSOR LOGIC

STEP-BY-STEP INSTRUCTIONS:

PART 1: BUILD THE COMPOST BIN

Components Needed

- Small cardboard box or wooden box
- Cutter/scissors
- Tape or glue
- Small hinge or tape flap for lid
- Dry leaves, paper bits, vegetable peels
- Arduino Uno
- Soil moisture sensor
- DHT22 sensor
- RGB LED or 3 LEDs

- Active buzzer
- Jumper wires
- Breadboard
- 220Ω resistors × 3 (if using separate LEDs)

Step 1: Make the Bin

- Take a small box and create a lid that can open and close
- Keep the size around 30 cm × 20 cm or similar

Step 2: Add Aeration Holes

- Make small holes on:
The sides
The base
- This allows airflow, which is important for composting

Step 3: Fill the Bin

Add a mix of:

- Dry leaves
- Small paper pieces
- Vegetable peels

Do not overfill. Leave some air space inside.

PART 2: PLACE THE SENSORS

Step 4: Insert Soil Moisture Sensor

- Push the moisture sensor probe into the compost material
- Ensure it is in contact with the moist waste, not just dry air

Step 5: Place DHT22 Sensor

- Keep the DHT22 inside the bin, slightly above the compost layer
- It should measure the internal temperature and humidity of the bin air

PART 3: CIRCUIT SETUP

Step 6: Connect Soil Moisture Sensor

- VCC → 5V
- GND → GND
- AO → A0

Step 7: Connect DHT22

- VCC → 5V
- GND → GND
- Data → Pin 2
- Add a 10kΩ pull-up resistor between VCC and Data

Step 8: Connect RGB LED or 3 LEDs

If using 3 separate LEDs:

- Green LED → Pin 9 through 220Ω resistor
- Yellow LED → Pin 10 through 220Ω resistor
- Red LED → Pin 11 through 220Ω resistor
- All negative legs → GND

Step 9: Connect Buzzer

- Positive leg → Pin 8
- Negative leg → GND

PART 4: UPLOAD CODE

PART 5: TEST THE SYSTEM

Step 11: Power On and Observe

- Open Serial Monitor
- Check:
 - Moisture value
 - Temperature
 - Humidity
 - LED color

Step 12: Understand LED Meaning

- Green = compost conditions are healthy
- Yellow = compost is too dry
- Red = compost is too wet or too hot
- Buzzer ON = temperature above 60°C

PART 6: MONITOR FOR 3 DAYS

Step 13: Record Readings

Take readings over 3 days, at the same time each day if possible.

Create a table in your notebook:

Day	Moisture value	Temprature (°C)	Humidity (%)	LED Status	Observati on
1					
2					

Step 14: Observe Material Changes

Look for:

- Smell
- Moisture level
- Softening of waste
- Visible decomposition

PART 7: REFLECTION AND RESEARCH

Step 15: Think About Compost Health

Discuss:

- Is the compost too dry or too wet?
- Is the temperature rising over time?
- What changes improve composting?

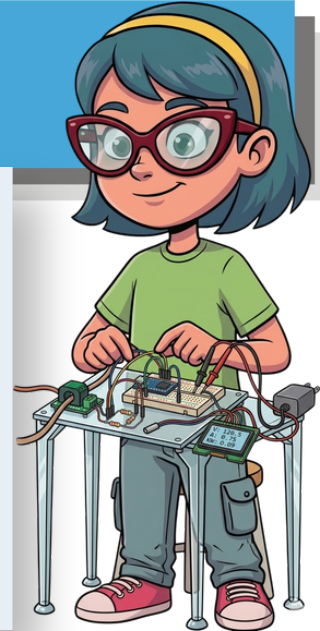
CLICK FOR VIDEO TUTORIAL LINK : WHY IS COMPOSTING GOOD FOR THE ENVIRONMENT?

DHT22 TEMPERATURE AND HUMIDITY SENSOR WITH ARDUINO

ACTIVITY 2: GRAVITY-ASSISTED WASTE SORTING MECHANISM

Materials Needed:

- L293D motor driver module
- BO DC motor (150 RPM) × 1
- Small conveyor surface (cardboard belt on skewer rollers)
- LDR sensor × 2 OR Colour sensor (TCS3200)
- LEDs (Red + Green)
- Arduino Uno
- Jumper wires
- Cardboard for chute construction



Level 2 : MOTORS + SENSORS + CONDITIONAL AUTOMATION

STEP-BY-STEP INSTRUCTIONS:

PART 1: BUILD THE CONVEYOR SYSTEM

Components Needed

- Cardboard base
- 2 wooden skewers (rollers)
- Cardboard strip (belt)
- BO motor
- Rubber bands/tape (for grip)
- Glue/tape

Step 1: Create Rollers

- Fix two skewers parallel to each other on the base
- Ensure they can rotate freely

Step 2: Add Conveyor Belt

- Wrap a cardboard strip around both rollers
- Secure ends with tape to form a loop

Step 3: Attach Motor

- Connect motor to one roller
- Use rubber band or direct attachment
- When motor rotates → belt moves

PART 2: INSTALL SENSORS

Components Needed

- 2 LDR (Light Dependent Resistor) sensors
- 2 resistors (10kΩ recommended)

Step 4: Mount LDRs

- Place 2 LDRs above the belt:
LDR 1 → detects incoming object
LDR 2 → confirms/validates reading

Step 5: Connect LDRs (Voltage Divider Setup)

For each LDR:

- One leg → 5V
- Other leg → Analog pin (A0 / A1)
- Add resistor from analog pin → GND

PART 3: MOTOR DRIVER SETUP

Components Needed

- L293D motor driver
- Jumper wires

Step 6: Connect Motor to L293D

- Motor terminals → Output pins of L293D
- Enable pin → 5V
- Input pins → Arduino pins (e.g., 7 and 8)
- VCC → 5V
- GND → GND

PART 4: SORTING MECHANISM

Step 7: Build Chutes

- Create two paths at the end of conveyor:
Left → Recyclable (Green chute)
Right → Non-recyclable (Red chute)

You can use:

- Cardboard flaps
- Tilted guides

PART 5: UPLOAD CODE

PART 6: TESTING THE SYSTEM

Step 9: Test with Materials

Try:

- White paper → should go to recyclable (green)
- Dark plastic → should go to non-recyclable (red)

Observe:

- Does the belt move correctly?
- Does sorting direction change?

PART 7: MEASURE ACCURACY

Step 10: Conduct Trials

- Test with 20 items
- Record:

Item	Expected Output	Actual Output	Correct ?
1			
....			

Step 11: Calculate Accuracy

Accuracy = (Correct predictions / Total items) × 100

Example:

16 correct out of 20 → 80% accuracy

CLICK FOR VIDEO TUTORIAL LINK : [USE AN LDR SENSOR WITH ARDUINO](#)

DESIGN THINKING MISSION: PITCH

THE CHALLENGE:

Your monthly mission: Present your solution in a clear, compelling, and convincing way.

You have:

Understood the problem

Built and improved your prototype

Now your task is to communicate your idea so others understand its value and potential impact.

This is not just about speaking.

This is about:

Telling a clear story

Showing real evidence

Convincing others that your solution matters



WHAT TO SUBMIT:

Pitch Presentation (2-3 minutes):

Create a short pitch (video or live presentation) covering:

The problem

Your solution

How it works

Why it matters

Problem-Solution Story:

Clearly explain:

What is the problem?

Who is affected?

How does your solution help?

Prototype Demonstration:

Show your working model:

Key features

How it functions

What makes it unique

Impact Explanation:

Estimate:

Who will benefit?

How much change can it create?

What happens if more people use it?

Step	What to Do	How to Do it	Output
1	Structure Story	Problem → Solution → Impact	Story flow
2	Create Script	Write 2-3 min pitch	Script
3	Prepare Prototype Demo	Decide what to show live	Demo plan
4	Explain Problem Clearly	Use real observations and users	Problem clarity
5	Explain Solution	How it works step-by-step	Solution explanation
6	Highlight Uniqueness	What makes your idea different?	Key points
7	Estimate Impact	Who benefits? How much change?	Impact statement
8	Practice Pitch	Rehearse 2-3 times	Improved delivery
9	Record/Present	Submit video or present live	Final pitch

Judging Criteria:



- Clarity of Communication (25%) – Is the pitch easy to understand?
- Problem-Solution Connection (20%) – Is the solution clearly linked to the problem?
- Prototype Demonstration (20%) – Is the working model effectively shown?
- Impact Communication (20%) – Is the potential impact clearly explained?
- Confidence & Structure (15%) – Is the pitch well-organised and engaging?