KA220YOU ECO INNOVATORS
Next-Gen Sustainability through Science and Innovation
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GREENLINK HUB · LEARN · LESSON PLAN

From Problem to Playable Prototype

Young people with no coding experience build a 3D game in Unity that reacts to a real environmental measurement from an Arduino sensor. Tested with 36 participants from three countries at LTT3, Balıkesir, September 2026.

AGE GROUP	DURATION	GROUP SIZE	LEVEL
15+	4 days · or 8 lessons	Teams of 6	No coding needed

01 The idea in one paragraph

Environmental data is invisible: nobody sees CO_2, soil moisture or noise. In this programme each team picks a real environmental problem, builds a small 3D game scene about it, and connects one sensor so that the real world changes the game — breathe on the air sensor and the city fills with smog; water the plant pot and the virtual field recovers. Teams then base their game's scoring on three real, sourced figures. The result is a working prototype that makes an environmental problem visible and playable.

THE THREE DESIGN RULES THAT MADE IT WORK

1 · Zero code. Participants never write code. A prepared Unity starter kit and a six-line Arduino sketch remove the technical barrier entirely. **2 · Little talk, lots of doing.** Total lecture time over four days was about 35 minutes; everything else was hands-on. **3 · Visual, not textual.** Mixed-language teams worked with post-its, drawings and printed templates.

Results from LTT3: all six teams finished a working prototype; participants rated their confidence with digital tools 2.3/5 before and 4.1/5 after the activity (n = 7, retrospective survey).

02 Learning outcomes

- Turns an environmental problem into a measurable project concept, using the Five Whys to find the root cause.
- Applies life-cycle thinking to an everyday product.
- Connects a physical sensor to a digital simulation and explains what the data shows.
- Finds, checks and cites real environmental figures.
- Works in an international team under time pressure and presents a working demo to a jury.

03 Formats

Format	What to keep	Typical setting
Full — 4 days	Everything below; the version delivered at LTT3.	Youth exchange, training course
School — 4 × 2 lessons	Day 1 → lessons 1–2 · Day 2 → 3–4 · Day 3 → 5–6 · pitch → 7–8. Skip the outdoor session; keep the card game and the sensor station.	Science, technology or IT classes

Taster — 1 day	One shared theme, one sensor, a pre-built scene: teams only change values and connect the sensor.	Open day, local youth event

04 Programme — four days

Day	Activities and methods	Output
1 · Start	Post-it country wall · Kahoot pre-test · Unity installed and played on every computer · outdoor nature-observation hunt · reflection circle and 15-second pledge videos	Mixed teams of six · Unity running · problem cards
2 · Problem & concept	Gallery walk and dot voting on problems · Five Whys · Crazy 8s · Green Project Card (see Apply) · peer consultancy ("questions only") · *Product Life Story* card game (see Interact) · number hunt: three sourced figures turned into a score formula	Locked theme · completed project card · first Unity scene
3 · Build	Parallel stations: four members on Unity, two on Arduino · sensor bingo calibration · the moment the sensor first changes the game · Mini Green Business Model Card · green enterprise marketplace (play money) · expert speed-dating	Playable scene · working sensor station · business model card
4 · Hackathon	90-minute sprint with visible countdown · mentors ask one question only: "Can it be played from start to end right now?" · project freeze · safety build and backup · 60-second screen recording as demo fallback	Frozen, backed-up project
5 · Show	Presentations to a jury and a local audience · post-test while the jury deliberates · awards and certificates	Six presented prototypes

05 Six tested themes

All six sensors are analogue and use exactly the same code. Choose the themes that fit your group.

Theme	Sensor	Player action	What the sensor changes
Clean Air	MQ-135 air quality	Places trees and cycle lanes in a city	Smog density and sky colour
Water Watch	Soil moisture (capacitive)	Decides which field to irrigate on a water budget	Health of the virtual crops
Light Hunter	LDR light sensor	Switches off lights left on in a school	Day/night state of the building
Quiet City	Sound level module	Silences noise sources, places green barriers	Noise meter and screen shake
Heat Scout	LM35 temperature	Places watchtowers in a forest	Fire-risk barometer and alarm
Clear Sea	LDR + water container	Dives to collect plastic on limited oxygen	Underwater visibility

06 Technical set-up

Data flow

Real world → sensor → Arduino `analogRead(A0)` gives 0–1023 → USB serial at 9600 baud, ten readings a second → a ready-made Unity script turns it into a value from 0.0 to 1.0 → that value drives fog, light, health or risk.

Three-wire rule

Red → 5V · Black → GND · Yellow → A0. No libraries, no settings, no Wi-Fi. For an LDR, add a 10 kΩ resistor from A0 to GND (a voltage divider) — give teams a laminated wiring diagram.

The whole Arduino sketch

```
void setup() {
  Serial.begin(9600);
}

void loop() {
  int value = analogRead(A0);  // 0 - 1023
  Serial.println(value);
  delay(100);                  // 10 readings
per second
}
```

Participants only press Upload. In Unity they drag the reader prefab into the scene and choose the COM port from a drop-down. Set Unity's API compatibility level to .NET Framework, otherwise the serial port cannot be read.

Preparation checklist

☐ Starter kit ready on every computer at least two days before: one sample scene per theme, prefabs, serial reader.

☐ USB drivers installed; every cable tested and labelled "DATA" (charge-only cables are the most common failure).

☐ Spare laptops; sensor kits sorted by theme; printed project cards, business model cards, jury rubric and card-game envelopes.

07 Assessment

Use the jury rubric in the Apply section (*Mini Green Business Model Card & Pitch Rubric*). Hand it out on Day 3 so teams know how they will be judged. Run the same ten-question quiz on Day 1 and on the last day to measure learning gain — the EcoInnovators self-check quiz in the Interact section can be used.

08 Risks and fallbacks

Risk	What we did
Beginners stall in Unity	Starter kit with everything pre-built; warm-up micro-tasks on Day 1
Arduino not detected	Drivers pre-installed; every cable tested
Scope grows ("second level", "multiplayer")	Scope rule: one scene, one mechanic, three minutes of play — mentors say no politely
File lost at the last minute	Mandatory safety build and ZIP backup before the freeze
Live demo crashes	Every team records a 60-second screen capture as a fallback

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