

Below is a precise, two-student study plan for **Coastal Countdown** aligned to your “two 1-hour sessions per week” rhythm and the event constraint of **one double-sided 8.5”×11” reference sheet** (no tabs/attachments). It emphasizes experimental practice (hypothesis + CER), data/graph work, and fast explanations.

Coastal Countdown — 8-Week Plan (repeatable cycle)

Weekly time use (each 60-min session)

- **Warm-up (8–10 min):** 1 quick graph/map/read item + 1 definition/application.
- **Practice task (25–30 min):** Hands-on mini-lab or data analysis.
- **Explain (15–20 min):** Write **Hypothesis** or **CER** (swap and peer-edit).
- **Wrap (2–5 min):** Add one line to the reference sheet; note one gap.

Week 1 — Event orientation + core formats

Goals

- Know rules, scoring, and the one-page constraint.
- Master the two writing formats used in the event.

Session tasks

- Build the **skeleton** of the reference sheet (see “One-Pager Outline” below).
- Practice writing:
 - **Hypothesis (If–Then–Because)** template:

- *If we increase* ____ [independent variable], *then* ____ [dependent variable] will ____ (direction), *because* ____ (mechanism).
- CER template:
 - **Claim:** one sentence answering the prompt.
 - **Evidence:** 2–3 **numbers** with units (from table/graph).
 - **Reasoning:** link evidence → claim using a principle (e.g., thermal expansion, density, runoff).

Mini-lab: Food-color tracer in two water baths (warm vs. cool) to discuss **thermal expansion** and **density**.

Week 2 — Sea-level rise: causes & math

Content

- Drivers: **thermal expansion, land ice melt, land subsidence/uplift.**
- Rates: mm/yr → cm/decade.

Practice

- Graph reading set: interpret a line chart; compute **slope** over intervals.
- Problem set (quick math):
 - Example: *Rate = 3.4 mm/yr → cm/decade?*
 - $3.4 \text{ mm/yr} \times 10 = 34 \text{ mm/decade} = 3.4 \text{ cm/decade}$
 $3.4 \text{ mm/yr} \times 10 = 34 \text{ mm/decade} = 3.4 \text{ cm/decade}$
 $3.4 \text{ mm/yr} \times 10 = 34 \text{ mm/decade} = 3.4 \text{ cm/decade}$
- CER: “Which mechanism best explains a recent acceleration in the series?”

Add to one-pager

- “Rates & Units” box + two sample computations.
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Week 3 — Sunny-day (nuisance) flooding & king tides

Content

- **Sunny-day/high-tide flooding** = tidal flooding without storms.
- **King tides** = perigean spring tides (astronomical alignment); how higher baselines + SLR raise exceedance frequency.

Practice

- Tide table → identify days above a threshold at a given datum.
- Short CER: “Explain why street X floods on clear days in fall.”

Add to one-pager

- Definitions: sunny-day flood, king tide; simple **exceedance** diagram.
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Week 4 — Stormwater runoff & water-quality basics

Parameters

- **Turbidity (NTU), Salinity (ppt), Temperature (°C), Dissolved Oxygen (mg/L), pH, Nutrients** (nitrate/phosphate), **Fecal indicators** (qualitative awareness).

Practice

- Given a table (before/after rainfall): identify which parameters increase/decrease and **why** (dilution vs. inputs vs. temperature effects).
- Graph match: pair parameter trend lines to likely causes.

Add to one-pager

- “Typical direction after rain” mini-table (e.g., turbidity ↑, salinity ↓ near outfalls, DO variable with temp/turbidity/bioload).
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Week 5 — Modeling & maps

Skills

- Read **inundation maps**, simple cross-sections, storm drain schematics, and elevation profiles.
- Use a **bucket-and-board** model to show street-level ponding when tide backs up outfalls.

Practice

- Map station set: mark low points; trace pathways from tidewater to streets; predict first-flooding intersections.
- CER: “Which block floods first and why?”

Add to one-pager

- Mini legend: datum, MHHW vs. MLLW, “tidal backflow” sketch.
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Week 6 — Mitigation & adaptation strategies

Content

- **Grey**: backflow preventers, tide gates, pump stations, raised outfalls.
- **Green**: rain gardens, permeable pavements, living shorelines, detention.
- **Policy/design**: elevate roads/buildings, zoning, setback, managed retreat (define simply).

Practice

- Scenario matrix: match **cause** → **feasible strategy** (tide vs. runoff vs. groundwater).
- Quick cost-benefit reasoning: pick 2 options and justify.

Add to one-pager

- “Match-ups” table: *Problem* → *Strategy* → *One-line why it helps*.
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Week 7 — Investigation sprint (mock lab)

Event-style

- Instructor gives: **setup instructions**, a simple **dataset** (or students collect), and a **prompt**.
- Students:
 1. Write **If–Then–Because** hypothesis.
 2. Run/organize data.
 3. Create a quick graph (axes labeled, units).
 4. Write **CER** (2–3 numeric evidence points).
 5. One-minute peer audit (numbers/units/mechanism check).

Example investigation prompts

- *If we increase water temperature by ~10 °C, then density decreases and water level rises in a sealed arm because of thermal expansion.*
 - *If we raise tidal boundary elevation by 10 cm, then the modeled outfall backs up more frequently because head difference reverses flow.*
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Week 8 — Full mock & refinements

Session A

- 60-min mixed stations (graphs/maps/definitions/short math + 1 lab-style item with HYP + CER).

Session B

- Error analysis; **rewrite** any weak CER's; **finalize** the one-pager (remove fluff; enlarge must-have visuals; ensure both sides are dense but readable).
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Two-Student Role Plan

- **Student A (data lead):** Graphs, rate math, tide tables, mapping.
 - **Student B (writing/mechanisms):** Hypotheses, CER, mechanism explanations, mitigation mapping.
 - **Swap** roles on alternating weeks. In competition, reserve last **8–10 min** for **cross-check**:
 - A checks **numbers/units/axes**.
 - B checks **causal language/mechanisms**.
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Event Writing Checklists

Hypothesis (If–Then–Because)

- **If** (IV + direction, unit/amount if known)
- **Then** (DV + expected direction, comparative or quantitative)

- **Because** (named mechanism: thermal expansion, density, backflow, dilution, residence time)

Example

If salinity at the outfall increases by ~5 ppt during a king tide, then street-level water depth at the low point will increase, because higher tide elevation reduces the head difference and causes backflow through the storm drains.

CER (Claim–Evidence–Reasoning)

- **Claim:** One sentence answers the question (no numbers).
- **Evidence:** 2–3 **specific** values with units from the table/graph (include time window).
- **Reasoning:** State mechanism connecting evidence → claim (cause → effect chain).

Quick rubric (self-score 0–2 each)

- Claim (0–2): off-topic / partial / directly answers.
- Evidence (0–2): none / qualitative only / **quantitative with units**.
- Reasoning (0–2): vague / partly causal / **clear mechanism named**.

Ready-to-Use Practice Sets (you can print)

1. Sea-Level Rate Mini-Set

- Q1: From 1995–2005 line segment, slope \approx **2.8 mm/yr**. Convert to **cm/decade**.
- Q2: If the next decade rises at **4.2 mm/yr**, how much in **cm**?
- Q3: Which interval shows **acceleration** and how do you know? (evidence: steeper slope; numbers).

2. Sunny-Day Flood / King Tide Set

- Tide table includes days exceeding local threshold by **+0.15 m**. Identify three exceedance days and **explain** why fall months show more exceedances (astronomical +

baseline SLR).

3. Runoff & Water-Quality Table

- After 24 mm rain: **turbidity 8→46 NTU, salinity 24→11 ppt** at a creek mouth, **DO 7.8→6.1 mg/L, temp 21→19 °C, nitrate 0.4→1.2 mg/L**.
 - Write a 3-sentence **CER** explaining two parameter shifts and their mechanisms (sediment input, dilution, temperature-DO relationship).

4. Mitigation Match

- Problems: *tide backflow, impervious area runoff, low-lying road dips*.
 - Strategies: *backflow preventer, permeable paving + bioretention, road elevation with culverts/pumps*.
 - For each pair, add a **one-line mechanism** to justify.
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One-Pager (Double-Sided) Content Outline

Side A — Concepts & Processes

- **Drivers of SLR:** thermal expansion, ice melt, subsidence/uplift (1-line each).
- **Sunny-day flooding & King tides:** short definitions + mini graphic.
- **Mechanism snippets** (for Reasoning): density/temperature, dilution, backflow/head, turbidity-light-DO.
- **Hypothesis & CER** mini-templates (one line each).
- **Mitigation map:** Problem → Strategy → Why it helps.

Side B — Data & Quick Math

- **Units & conversions:** mm ↔ cm ↔ m; decade conversions; ppt/psu note; °C; mg/L; NTU.

- **Rate formula:** slope = $\Delta\text{height}/\Delta\text{time}$; examples filled in (3.2 mm/yr \rightarrow 3.2 cm/decade).
- **Reading graphs:** axes labels, baseline/datum note, identifying acceleration.
- **Water-quality quick cues:** After rain—turbidity \uparrow , salinity \downarrow (near outfalls), DO often \downarrow if warm/turbid/bioload \uparrow ; pH tends to shift toward source waters.

Formatting tips for the sheet

- Use **tight bullets**, **micro-tables**, **icons** (Δ up, ∇ down), and **bold units**.
 - Favor **mechanism verbs** (warms \rightarrow expands; higher tide \rightarrow reduced head \rightarrow backflow; more impervious \rightarrow faster runoff \rightarrow higher peak).
 - Keep **numeric examples** minimal but visible (one per concept).
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Dry-Run Station Kit (for practice at school)

- Two clear bins, blocks (to make “streets”), ruler, food coloring, salt (to vary salinity), thermometers, turbidity tube (or white-card depth), graduated cylinders, stopwatch.
 - Create timed stations: **Graph slope**, **Tide exceedance**, **Runoff effects table**, **Mitigation match**, **Mini-lab with hypothesis/CER**.
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Competition-Day Routine (50–60 min event)

1. **Skim all tasks (2–3 min)**; star anything with a **graph/table** and problems you drilled.
 2. **Do numeric/data tasks first** (fast points) \rightarrow write CER with **2 numbers**.
 3. **Then** concept questions (drivers, definitions, mitigation).
 4. **Reserve 6–8 min to audit:** numbers/units on graphs; underline your **Claim**; circle **Evidence** numbers; box the **mechanism** word in Reasoning.
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If you want, I can turn the **one-pager outline** above into a **print-ready double-sided PDF** with compact tables, mini-graphics, and a few solved examples, tailored to your team's exact font and spacing preferences.