Advanced AI Use for Debugging and Learning Lesson Plan

Duration: ~60 min | **Audience:** CS1/CS2 students (builds on Modules 1 and 2) | **Format:** Pair- and team-based

Objectives

By the end of this module, students will:

- Apply advanced prompting techniques: iterative refinement, chain-of-thought, and persona/role prompting
- Practice character traits — **honesty, humility, courage, and integrity** — when crafting prompts

Materials

Access to any AI chatbot; two short buggy code snippets (instructor's choice of language); Prompt Surgery handout; sticky notes or shared anonymous doc.

Lesson Plan

Opening (8–10 min)

Display: *"Think of the last time AI gave you a confusing, wrong, or unhelpful answer. What went wrong?"* Students submit responses anonymously; instructor reads 3–4 aloud.
Reframe: Most of these are *prompt problems*, not AI problems. The prompt mirrors how clearly we can articulate our own thinking. Today is about getting better at that — and being honest when the mirror shows something we don't like.

Part 1 — Interrogate the AI (10–12 min)

Present two students with identical bugs, identical grades, but different approaches:

- **Student A:** Asks AI to "fix my code," pastes the result, submits.
- **Student B:** Asks AI to walk through what's happening *before* suggesting a fix, understands the concept, writes her own fix, submits.

Discuss:

- *Are both honest — with their professor? With themselves?*
- *What happens on the next similar bug?*
- *Which showed intellectual courage?*

Introduce integrity (new in M3): *consistency between your values and your actions, even when no one is watching.*Revisit honesty, humility, and courage from Module 1 in the context of prompting.

Part 2 — Prompt Surgery Workshop (20–25 min)

Pair students: **Driver** (writes the prompt) and **Navigator** (evaluates and documents). Switch roles each round.
Task: A short buggy code snippet (e.g., off-by-one in a loop, integer division issue).

- **Round 1 — Baseline (5 min):** Driver writes the first prompt that comes to mind. Pause and ask: *Did the AI give you code with no explanation? Did you learn why it was wrong?* → **Honesty connection.**
- **Round 2 — Chain-of-thought (8 min):** Demonstrate live a structured prompt: *"Before suggesting a fix: (1) identify every bug, (2) explain in plain English why each is a problem, (3) name the concept each bug relates to, and only then (4) show a corrected version with comments."* Pairs rewrite their prompts in this structure; Navigator documents what new information appeared. → **Humility connection.**
- **Round 3 — Iterative refinement + persona (8 min):** Demonstrate follow-up prompts (e.g., *"Your explanation makes sense, but I don't understand X — give me an analogy without code"*; *"Now act as a code reviewer — what edge cases could still break this?"*). Pairs send at least two follow-up prompts building on Round 2. → **Courage connection.**

Part 3 — Prompt Battle Team Challenge (15–18 min)

Form teams of 3–4. Give all teams the same new buggy snippet.

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Setup (2 min): Each team has 7 minutes to craft the single best prompt to *both* fix and explain the bug. The prompt must (a) use at least one Part 2 technique, (b) ask for explanation, not just a fix, and (c) reveal at least one concept transferable to other code.
Battle (8 min): Each team reads their prompt aloud or projects it. Class votes on a 1–3 scale for **clarity, depth, and humility.** Brief discussion: *What did the top team do that others didn't?* Peer-to-peer feedback lowers the threshold for participation.

Optional Extension — The Integrity Edge Case (5–7 min)

Present a scenario: a professor allows AI for syntax help but not algorithm design; a student asks AI for an efficient sorting approach and writes the code themselves. Discuss:

- *Did this violate the spirit of the policy?*
- *What's the difference between AI as a tool and AI as a brain?*
- *How does the answer change if the student fully understands the algorithm vs. doesn't?*

Key insight: *Integrity isn't a rule someone else enforces — it's the standard you set for yourself. The question isn't "is this allowed?" but "is this making me better?"*

Closing (5–7 min)

Brief reflection — oral or written, individual or paired:

- *Before today, I thought a good prompt was ___. Now I think a good prompt is ___.*
- *Today I practiced (honesty / humility / courage / integrity). The hardest part was ___. One technique I'll use this week is ___. One thing I still don't understand is ___.*

Key takeaway: *Chain-of-thought = humility · Iterative prompting = courage · Honest prompts = better learning · Integrity = the long game.*

Adaptable Variations

- **Shorter (40 min):** Drop the Prompt Battle; keep Parts 1 and 2 only.
- **Different language or course level:** Any buggy snippet appropriate to the audience works; the prompting techniques are language-independent.
- **Reserved students:** Use anonymous prompt submissions for Battle voting to reduce social pressure.

Handout 1: The Code

Instructor adds the code

Round 1: Baseline prompt (5 min)

Students write their first prompt

Round 2: Chain-of-thought prompt (5 min)

Students write the second prompt using chain-of-thought strategy

Round 3: Iterative refinement + persona prompt (8 min)

Students write the refined prompts

Handout 2: The code

Instructor adds the code

Your Prompt

The AI output

Vote

- Clarity (was the prompt easy to understand?)
- Depth (would the response actually teach something?)

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- Humility (did the prompt admit what wasn't known?)

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