

Lesson 8: Debugging and Refining Outputs

45 minutes

Overview

Career Journeys

Can we improve AI's responses?

Students explore how to improve AI-generated responses by refining their prompts using a five-step framework: task, context, reference, format, and tone. Through hands-on exploration in AI Chat levels, they test different prompt modifications, analyze how AI responds to varying levels of detail, and apply debugging techniques to enhance accuracy. At the end of the lesson, students summarize their learning about AI prompt refinement by adding ideas to a classroom Anchor Chart.

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

- CS - Computing Systems

Agenda

Warm Up (5 minutes)

What is a Prompt Engineer?

Activity (35 minutes)

AI Prompting Framework

Check Your Understanding

Wrap Up (5 minutes)

Key Elements Anchor Chart

Objectives

Students will be able to:

- Apply debugging techniques to improve AI-generated responses.
- Explain how prompt refinement improves AI outputs.

Preparation

- Prepare a classroom anchor chart containing five columns - Task, Context, Format, Reference, and Tone.

Links

Heads Up! Please make a copy of any documents you plan to share with students.

For the teachers

- **[KEY] Problem Solving with AI Unit Guide Exemplar** - Answer Key
▼ Make a Copy

For the students

- **AI's Hottest New Job Pays Up to \$250K a Year. So I Applied. | WSJ** - Video
- **Problem Solving with AI Unit Guide** - Activity Guide
▼ Make a Copy

Vocabulary

- **prompt engineering** - the process of creating precise and effective prompts to guide generative AI models

Teaching Guide

Warm Up (5 minutes)

What is a Prompt Engineer?

 **Goal of this activity:** To introduce an interesting new career that is related to the work that students will be asked to do today— refining prompts in order to produce high-quality AI output.

 **Video:** Show the "AI's Hottest New Job Pays Up to \$250K a Year. So I Applied" video.

Questions to consider with the video:

- *What does a prompt engineer do?*
- *What skills do you need to have to be a prompt engineer?*

Discussion Goal: Students should be able to explain that a prompt engineer is someone who develops prompts to get the best output from a large language model. A prompt engineer needs to be good at writing clearly and giving good instructions. They should know how to translate between a machine and a human.

☒ **Do This:** Define *prompt engineering*.

☒ **Do This:** Introduce the lesson objectives.

☒ **Do This:** Introduce the Question of the Day.

Activity (35 minutes)

AI Prompting Framework (25 minutes)

 **Goal of this activity:** Provide students with a structured method to improve AI-generated responses using five key elements of a strong prompt. They will have a chance to test out each method as they work through levels.

☒ **Do This:** Click through the animated slide to introduce the key elements of a prompt. Explain that just like giving instructions to a friend, the more details you provide, the better the response. By specifying what we want AI to do, giving context, and even suggesting a format, we can make AI's responses much more useful.

☒ **Do This:** Introduce "TaCo FoRT" as a mnemonic: **T**ask, **C**ontext, **F**ormat, **R**eference, **T**one.

Teaching Tip

Suggest that students remember "TaCo FoRT" so they can systematically check if they've included each element in their prompts. This prompting framework can be used in future interactions with AI Chatbots in this lesson and beyond.

Behind the Curtain: Explain to students that AI doesn't understand a user's intent. Instead, it sees words in context and simply *guesses* what should come next. Strategies like TaCo FoRT work because each element in gives an AI chatbot more structure and context from which to make its guesses.

 **Distribute:** Direct students to take out their Problem Solving with AI Unit Guide.

 **Transition:** Direct students to Lesson 8, Level 1 to practice providing the core task or objective the AI needs to address. Students should complete the corresponding section of their Unit Guide.

Circulate: As you move around the room and engage students in thoughtful reflection by asking, "How did AI's response change after you added context?" or "Did AI follow your requested format? Why or why not?" or "What's still missing from AI's response?". Offer guidance if a prompt remains too vague (e.g., "Make sure you tell the AI exactly what you want it to do!").

Discuss: Click through the animated slide to display the prompts.

- *What task did you add to the original prompt?*
- *How did refining the prompt improve AI's output?*

Discussion Goal: The aim is for students to recognize that making the Task explicit often leads to more focused and relevant AI replies. They should see how even small changes in wording can clarify the objective for the AI. This discussion should serve as an opportunity for guided practice before students work independently through the next four refining output activities.

Do This: Explain the connection between *refining a prompt* and *debugging* in traditional software development.

Do This: Direct students to Lesson 8, Level 2 to complete Levels 2 through 5. Students should complete the corresponding sections of their Unit Guide.

- **Level #2:** Students practice providing necessary background information to give context for the task.
- **Level #3:** Students practice providing references, examples, or models to guide the AI.
- **Level #4:** Students practice specifying the format in which the response should be delivered.
- **Level #5:** Students practice setting the tone for the AI response.
- **Level #6:** Students answer a quick questions related to careers in computing science.



Circulate: As you move around the room and engage students in thoughtful reflection by asking, "How did AI's response change after you added context?" or "Did AI follow your requested format? Why or why not?" or "What's still missing from AI's response?"

Do This: Click through the animated slide to review the outcomes of debugging and refining output. Ensure students understand that every time they refine their prompt, they are debugging AI—just like a programmer debugs their code. The first response might be generic, but by adjusting details and testing different versions, they can generate clearer, more accurate AI outputs.

Check Your Understanding (10 minutes)

Goal of this activity: Students refine a generic prompt using the Prompting Framework to improve accuracy.

Do This: Direct students to Lesson 8, Level 7 to complete Levels 7 through 9.

- **Level #7:** This panel level serves as a review of the key elements of prompt refinement.
- **Level #8:** Students choose a generic prompt to improve. They use at least three elements (Task, Context, Reference, Format, Tone) and iterate on their prompt until they have one that consistently generates helpful AI output.
- **Level #9:** Students copy their revised prompt from Level 8 into the free response level. Then they explain why their revised prompt led to a better result than the initial generic prompt.



7-9

Check Your Understanding

7

8

9



Assessment Opportunity



The assessment on Level 9 can be used as a formative assessment of the lesson objectives. As students submit their final revised prompts, circulate and provide quick feedback by:

- Looking for clear, specific refinements that improved the AI's output.
- Asking probing questions like:
 - "What made the AI's response better after refining your prompt?"
 - "How did adding context change the AI's response?"
 - "Why do you think AI initially struggled with this prompt?"

Wrap Up (5 minutes)

Key Elements Anchor Chart

 **Goal of this activity:** Students summarize their learning about AI prompt refinement in a concise, creative, and engaging way.

 **Do This:** Review the lesson objectives.

 **Do This:** Review the Question of the Day.

 **Distribute:** Give each student a sticky note.

 **Do This:** Instruct students to take a minute and answer the Question of the Day on a sticky note, providing a specific example of how one of the key element (Task, Context, Format, Reference, Tone) might be used to refine output.

Example Student Responses:

- **Format:** Write a poem, such as a haiku or limerick
- **Tone:** Write in a professional tone, as if you are a college admissions counselor

 **Circulate:** Prompt deeper thinking with a guiding question:

- *What strategies did you use in the levels?*
- *Give an example of how you added more context or chose a different tone.*

 **Do This:** Have students add their sticky notes to the classroom anchor chart.



Teaching Tip



Use color-coded notes for different key elements to create a more structured visual representation. This classroom anchor chart will become useful for students to try new ways to refine their prompts throughout this unit and others in the CSAIF curriculum. Encourage students to add to the anchor chart whenever they have a new way of refining their prompts that leads to more interesting, accurate, and fair output.



Assessment Opportunity



The Question of the Day can be used as a formative assessment of understanding the relationship between prompting techniques and improved AI-generated responses. Make sure students write their name on their sticky note if you plan to use it as an assessment.



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