WeTeach_AI

Launching Into Stars & AI Prompting

Grade Level: **9-12** | Duration: **60 Minutes** | Subject Area: **Astronomy**

LESSON TABLE OF CONTENTS

This lesson was designed for the WeTeach_AI **Advancing AI Literacy Project**. The project supports the development of standards-aligned AI literacy lessons written by teachers for teachers. Additional lesson plan material, such as rubrics, answer keys, activity guides, and instructional considerations can be found here on our website.

*The contents of this digital lesson were developed by the Texas Advanced Computing Center (TACC) with the support of Google.org. However, the contents do not necessarily represent the policies of Google.*

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"After 15 years in 6th-8th-grade science, I transitioned to CTE in 2021 to teach Computer Science and Robotics. I'm a lifelong learner and PhD candidate in Curriculum and Instruction with a STEM focus at Texas Tech. My goal is to equip students with future-ready skills in critical thinking and problem-solving via real-world connections. This AI lesson is meant to combine my love for science, technology, and AI to bring relevancy and revitalize topics involving stars and the HR diagram."

Lesson Description

In this introductory lesson, students embark on a journey to understand the life cycle and classification of stars through the lens of data science and artificial intelligence. They begin by observing stellar patterns and engaging in a "Notice & Wonder" activity to spark curiosity. The class then transitions into a hands-on mini-lesson on AI prompting, where students learn how to craft effective queries to extract meaningful information from AI tools. This foundational experience sets the stage for deeper exploration of how AI can support scientific inquiry.
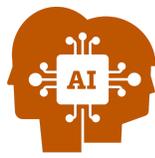
Lesson Objectives
(formatted as "Students will be able to..." statements)

- Describe the purpose and structure of the Hertzsprung-Russell (HR) diagram.

- Distinguish key stellar properties (temperature, size, luminosity, color, mass, chemical composition).

- Explain what makes an effective AI prompt.

- Analyze examples of AI prompts to determine characteristics of effective prompting.

- Create AI prompts tailored to specific scientific questions and gathering scientific information.

Essential Questions

1. *What can we learn about stars by analyzing their properties?*

2. *How does the Hertzsprung-Russell (HR) diagram help us classify stars?*

3. *What makes an AI prompt effective?*

4. *How can AI help us explore scientific questions?*

TEKS Alignment (Texas Standards Alignment)

§112.48 Astronomy
(c)(13)(A): The student understands the characteristics and life cycle of stars. The student is expected to identify the characteristics of main sequence stars, including surface temperature, age, relative size, and composition.

(c)(13)(F): The student understands the characteristics and life cycle of stars. The student is expected to use the Hertzsprung-Russell diagram to classify stars and plot and examine the life cycle of stars from birth to death.
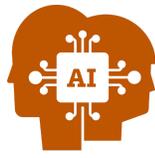
| CSTA/ISTE Alignment (National Standards Alignment)	
CSTA	**ISTE**
2-DA-08: Collect data using computational tools and transform the data to make it more useful and reliable.	**1.5.b**: Collect or use relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

Effective Pedagogical Strategies

|		
The instructor provides opportunities for students to include themselves in their learning, activities, and/or projects.	Activities that prioritize student questioning and discussion prompts with an emphasis on questions that promote higher order thinking skills (e.g., apply, analyze, evaluate) are selected.	The technology used is connected to and/or facilitates the development of the concepts or skills addressed in the curriculum.

AI Literacy Competencies

(based on TeachAI Framework)

Engage with AI 1: Recognize AI's role and influence in different contexts.	**Managing AI 1**: Decide to use AI systems based on the nature of the task.
	Managing AI 3: Direct AI systems by providing specific instructions and context.

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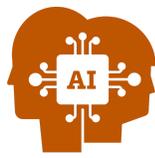
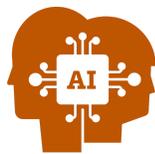| Key Terms	
Term	**Definition**
Artificial Intelligence (AI)	Technology that enables machines to perform tasks that normally require human intelligence, such as problem-solving, pattern recognition, and decision-making.
AI Prompt	A question or instruction given to an AI to generate a response.
Data Set	A collection of data or figures for analysis.
Kelvin	Temperature scale starting at absolute zero.
Luminosity	Total energy emitted by a star per second.
Magnitude	A luminous sphere of plasma held together by gravity.
Surface Temperature	A star's temperature, measured in Kelvin.
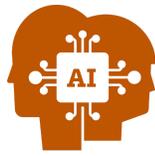
Launch

Engaging activity or prompt to introduce the lesson. **Estimated time: 15 minutes**

Objective: Describe the purpose and structure of the Hertzsprung-Russell (HR) diagram and begin exploring how AI can support scientific inquiry

Materials:
- Projector or screen for video
- Sticky notes or digital note-taking tool
- Student Cosmic Collaborators worksheet (provided in this lesson's resources)

Teacher Instructions	Sample Teacher Remarks
<u>Introduce the Lesson (3 min)</u> Explain that students will explore how scientists classify stars and how AI can help us understand complex data. Share the lesson's driving question: *"How can artificial intelligence help us understand the life cycle of stars?"* <u>Play the HR Diagram Video (5 min)</u> Ask students to take notes on what they notice and wonder during the [Stars and the HR Diagram video](#). <u>Notice & Wonder Activity (3 min)</u> Students should write one "Notice" and one "Wonder" on sticky notes or in their worksheet. Encourage observations about star color, brightness, temperature, and how stars are organized. <u>Whole Group Discussion (4 min)</u> Facilitate a whole class share out using prompts like: - "What patterns did you notice in the HR diagram?" - "Why do you think scientists use diagrams like this?" - "What kind of data do you think is needed to create a diagram like this?" - "How might AI help us collect or organize this kind of data?"	*"Today we're beginning our journey into the cosmos—not just to learn about stars, but to explore how artificial intelligence can help us understand them better. Over the next few lessons, you'll be acting like astronomers and data scientists, using AI to investigate the life cycle of stars.* *We're going to start with a short video that introduces a powerful tool astronomers use: the Hertzsprung-Russell diagram, or HR diagram. This graph helps scientists classify stars based on their brightness and temperature.* *As you watch, I want you to think like a scientist. What patterns do you notice? What questions come to mind? Use your worksheet to jot down your Notice & Wonder thoughts. You can write or sketch anything that stands out—colors, sizes, temperatures, or how stars are grouped."* ***(Display video and next facilitate discussion, pausing in-between, asking the following questions)*** *"Let's take a moment to share. What did you notice and wonder? Let's hear a few ideas... Why do you think scientists organize stars this way? What kinds of data do you think they need to build a diagram like this?"*

| Anticipated Student Outcomes	(Transition to AI connection)
- Students identify that the HR diagram organizes stars by brightness and temperature. - Students recognize that stellar properties (color, size, luminosity) are key to classification. - Students begin to wonder how AI could assist in analyzing large sets of star data.	*"Now imagine you're working with thousands of stars. That's a lot of data! This is where AI comes in. How might a computer help us make sense of all this information? What could it do faster or differently than a human?* *By the end of today, you'll be writing your own AI prompts—questions or instructions you give to an AI to help you gather star data. But first, let's make sure we understand what makes a good prompt."*

Exploration

Step-by-step student tasks, experiments, or investigations. **Estimated time: 25 minutes**

Objective: Students will write, revise, and test AI prompts to gather accurate star data.

Materials:
- Devices with access to AI tools (e.g., Copilot, ChatGPT, Claude)
- Student Cosmic Collaborators worksheet (provided in this lesson's resources)
- Optional: sample star data
- Optional: prompting strategy anchor chart

Teacher Instructions	Sample Teacher Remarks
<u>Introduce the Task (3 minutes)</u> Explain that students will practice writing prompts to collect star data using AI. <u>Prompt Practice (5 minutes)</u> Students use their worksheet to write an initial AI prompt asking for star data (e.g., "Tell me about the temperature and brightness of stars."). <u>Peer Review (7 minutes)</u> Students swap prompts and provide feedback using guiding questions: - Is the prompt specific?	*"Now that we've learned about the HR diagram, let's see how AI can help us gather star data. The way we ask AI questions—our prompts—matters a lot. Today, you'll write prompts that are clear and specific so AI gives you useful information.* *On your worksheet, write a prompt asking AI for star data. Think about what details you need: temperature, luminosity, color. Avoid vague prompts like 'Tell me about stars.' Instead, try something like: 'Provide the temperature and luminosity for five main sequence stars.'"*
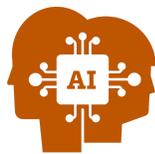
- Does it ask for measurable or observable data?
- Could it be improved with more detail?

Revision and Testing (10 minutes)
Students revise their prompts based on feedback. Next, students input their revised prompt into an AI tool and record the response.

Anticipated Student Outcomes

- Students will write increasingly effective prompts through revision.
- Students will recognize how prompt specificity affects AI output quality.
- Students will begin to see AI as a tool for scientific inquiry and data collection.

(Pause to provide students to draft a prompt in their worksheet)

"Now, swap your prompt with a partner. While reviewing your partner's prompt, answer these questions to provide them feedback: Is the prompt specific? Does it ask for measurable data? Could it be clearer? Give one suggestion for improvement."

(Students transition to revising their prompt and testing it in a class approved LLM or AI tool.)

"Now revise your prompt based on feedback. Enter it into the AI tool and record the response on your worksheet. If the output isn't what you expected, tweak your prompt and try again. Notice how small changes can make a big difference."

Whole Class Discussion

Discussion questions, teacher prompts, and expected student responses. **Estimated time: 10 minutes**

Objective: Students will explain how astronomers organize stellar data and how AI can assist in this process.

Materials:
- Projector or whiteboard for discussion notes
- Student Cosmic Collaborators worksheet (provided in this lesson's resources)
- Teacher discussion prompts (printed or digital)

Sample Teacher Remarks
"Now that you've watched the video, shared your Notice & Wonder observations, and practiced prompting an AI tool for information regarding star data, let's dig deeper. How do astronomers manage all the data they collect? And with the rise of AI, how might these tools help scientists? We'll also start thinking about what makes a good AI prompt."
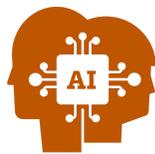
| Sample Discussion Questions	Sample Student Responses
1. How do astronomers organize and store the massive amount of stellar data they collect?	*"They use databases and diagrams like the HR diagram to classify stars by temperature and brightness."*
2. What kind of data is necessary to plot stars on the HR diagram?	*"Temperature and luminosity are the main factors, but also color, stellar radius, and sometimes mass."*
3. Why might AI be useful for astronomers when analyzing star data?	*"AI can process large datasets quickly and find patterns that humans might miss."*
4. "AI might give inaccurate results if the prompts are vague or if the data it was trained on is biased."	*"AI might give inaccurate results if the prompts are vague or if the data it was trained on is biased."*
5. What makes an AI prompt effective?	*"It should be specific, clear, and include details about the desired format or outcome."*

Assessment

Formative or summative assessment tasks and criteria. **Estimated time: 10 minutes**

Objective: Students will demonstrate understanding of HR diagram basics and characteristics of effective AI prompts.

Materials: Student Cosmic Collaborators worksheet and exit ticket or digital form for prompt submission

Assessment Opportunities	Facilitation Tips
Design Your Best AI Prompt Provide students with the following exit ticket prompts: - *What two properties are plotted on the HR diagram?* - *Give one example of a good AI prompt for finding star data.* - *Why is specificity important in AI prompting?* Alternatively, provide students with Quick Think-Pair-Share reflection:	Remind students to include details such as desired format and specific data points (e.g., temperature, luminosity). Encourage students to reflect on what they learned during the discussion about effective prompting. Provide sentence starters for students who need support (e.g., "Generate a list of stars that includes…").
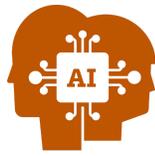
"Write one AI prompt you would use to gather data for an HR diagram. Share with a partner and explain why it's effective."

Providing the following submission options is recommended:
- Written paragraphs (Google Docs, LMS, or sticky notes).
- Audio or video response for students who prefer verbal expression.

✅Use the rubric provided in this lesson's resources to assess student submissions.

Measure students' ability to apply knowledge of stellar properties and AI prompting strategies.

Ensure students can articulate why their prompt is effective, demonstrating critical thinking about AI use in science.

Circulate during the activity to provide feedback and answer questions.

Collect exit tickets or digital submissions for review.

Highlight strong examples and discuss common misconceptions in the next lesson.