Mastering AI for Education: Prompt Engineering and Vibe Coding Techniques for Enhanced Teaching

Gheni Abla

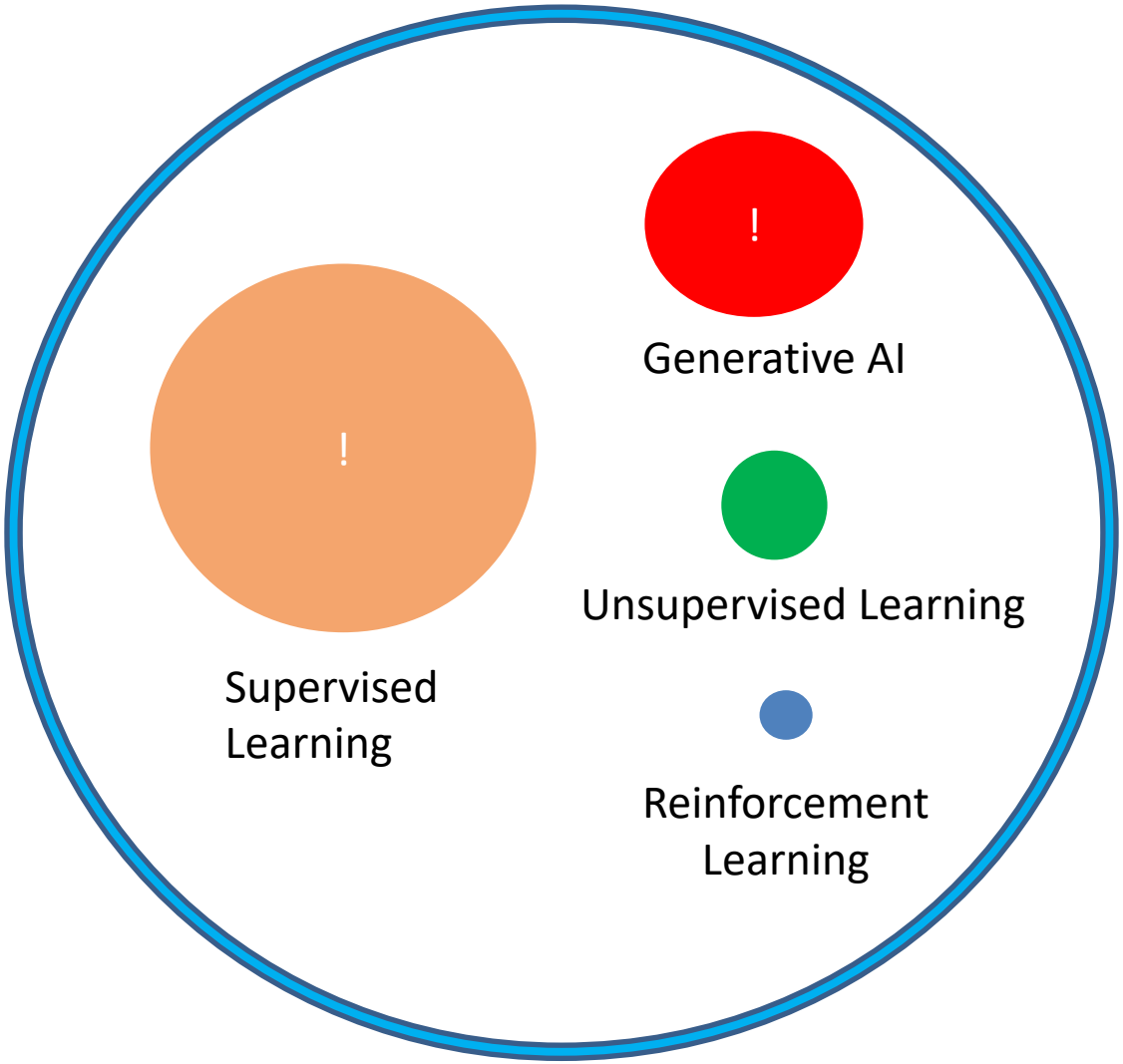
Objectives

- AI Literacy
- Understand prompt engineering fundamentals for educational AI use
- Explore and apply 'vibe coding' for teaching content creation

About Me!

- Director of Engineering at Financial Industry
  - Leadership and hands-on responsibilities on AI/ML for financial domain, data science, data engineering, & software development
- Part-time CS instructor at Palomar College
  - CSCI250 – Intro to Artificial Intelligence
  - CSCI290 – Intro to Machine Learning
- https://www.linkedin.com/in/gheniabla/

AI Technology Landscape



Supervised Learning

- **A task of learning a function that maps an input to an output based on example input-output pairs (A-> B)**

Input (A)	Output/Label (B)	Application
Email	Spam?(0/1)	Spam filtering
Lung X-ray image	COVID-19 (0/1)	Medical diagnose
Online reviews	Sentiment (pos/neg)	Reputation monitoring
3Bed/4Bath/2K sq house in SD	$1.15M	House price prediction
Image/Video	Inside a lane? (0/1) Position of objects	Self-driving cars

GenAI/LLM – Text Generation Process

- **Example:**

My favorite hobby is ----------

reading science fiction books while listening to smooth jazz music.

prompt AI output

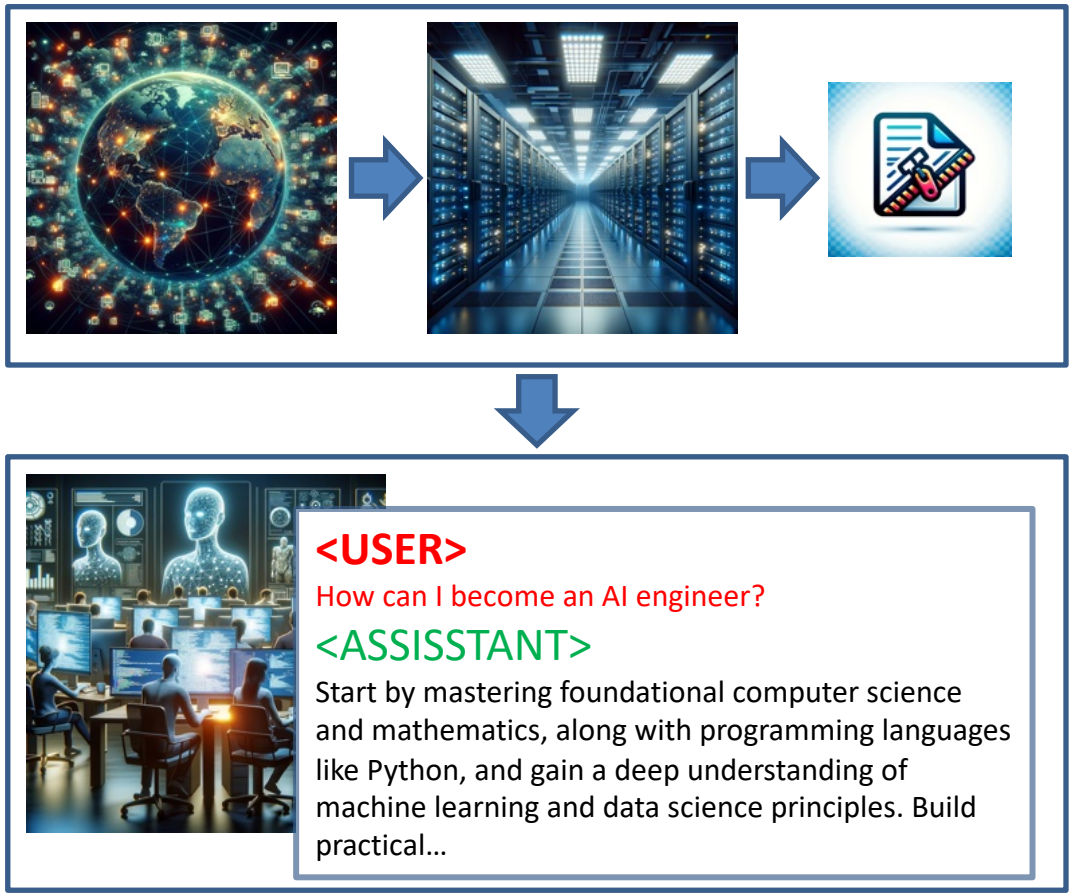
- **How it works:**

LM is built by supervised learning (A->B) to repeatedly predict the next word

Input (A)	Output (B)
My favorite hobby is	reading
My favorite hobby is reading	science
My favorite hobby is reading science	fiction
My favorite hobby is reading science fiction	books
…	…

- **LLMs (ChatGPT & friends) – result of training language models with lots of data with human in the loop (RLHF)**

How LLMs (Generative AI) are Created?



Stage 1: Pretraining

1. Download ~10TB internet scale text data
2. Super computer with many GPUs
3. Train neural network
4. Create base model weight file

Stage 2: Finetuning

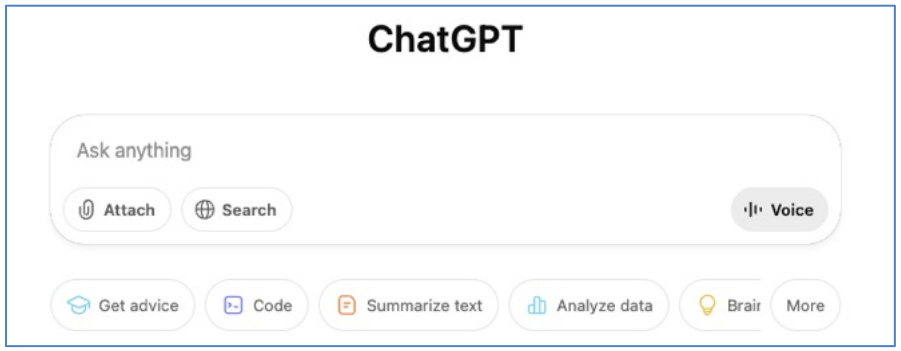
1. Prompt engineers labeling of Q&A
2. Fine tune the base model (~1 day)
3. Run lots of evaluations & corrections
4. Create finetuned model weight file
5. Deploy & monitor

Many LLMS Exist and Improving Rapidly

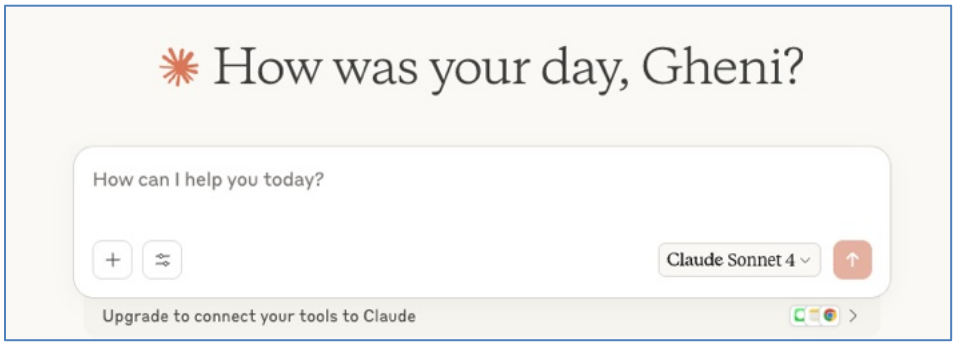
	FEATURES		INTELLIGENCE	PRICE	OUTPUT TOKENS/S	LATENCY	
MODEL	CREATOR	CONTEXT WINDOW	ARTIFICIAL ANALYSIS INTELLIGENCE INDEX	BLENDED *USD/1M Tokens*	MEDIAN *Tokens/s*	MEDIAN *First Chunk (s)*	FURTHER ANALYSIS
GPT-5 (high)	OpenAI	400k	69	$3.44	101.7	80.22	Model Providers
GPT-5 (medium)	OpenAI	400k	68	$3.44	153.3	42.54	Model Providers
Grok 4	xAI	256k	68	$6.00	79.3	4.70	Model Providers
o3-pro	OpenAI	200k	68	$35.00	26.1	84.56	Model Providers
o3	OpenAI	200k	67	$3.50	231.5	14.10	Model Providers
o4-mini (high)	OpenAI	200k	65	$1.93	118.1	41.45	Model Providers
Gemini 2.5 Pro	Google	1m	65	$3.44	144.9	37.40	Model Providers
GPT-5 mini	OpenAI	400k	64	$0.69	114.9	22.08	Model Providers
Qwen3 235B 2507 (Reasoning)	Alibaba	256k	64	$2.63			Model Providers
GPT-5 (low)	OpenAI	400k	63	$3.44	204.9	16.96	Model Providers
gpt-oss-120B (high)	OpenAI	131k	61	$0.26	188.4	0.43	Model Providers
Claude 4.1 Opus Thinking	ANTHROPIC	200k	61	$30.00			Model Providers

LLM Leaderboard - https://artificialanalysis.ai/leaderboards/models (Aug. 13, 2025)

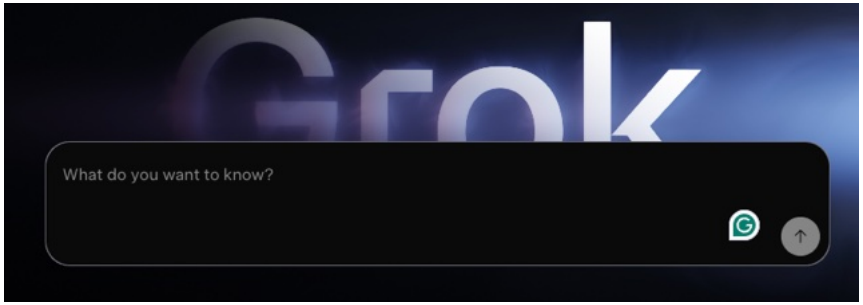
Popular LLMs



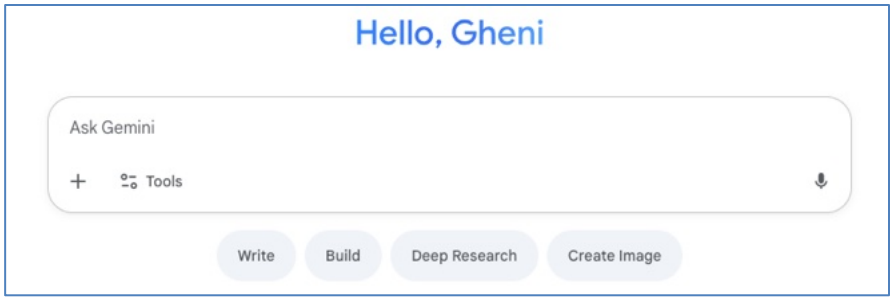
https://chatgpt.com. (OpenAI)



https://claude.ai. (Anthopic)



https://x.ai/ (xAI)



http://gemini.google.com/app (Google)

https://perflexity.ai (xAI)

Different Modalities of LLMs

Model Type	Modality	Example Functions
Text-only LLM	Text	Translation, summarization, chatbot
Multimodal LLM (MLLM)	Text, Image	Captioning, visual QA, text-to-image
Multimodal LLM (MLLM)	Text, Audio	Speech-to-text, text-to-speech
Multimodal LLM (MLLM)	Text, Video	Video QA, video captioning
Advanced MLLMs	3D Point Cloud, Sensor	Robotics control, scientific analysis

What is Prompt Engineering?

- **Prompt:** A prompt is the natural language text you provide to the LLM to instruct it on what task to perform.
- **Prompt engineering:** is crafting clear, specific inputs to guide AI outputs.
- Key principles for effective Prompt Engineering: Provide Context, be Specific, Build on Conversation

Provide Context

- Examples:
  - “What’s the best time of year to enjoy San Diego?”
  - “You are an experienced plat biologist specializing in avocado trees. Based on the recent weather patterns in the USA, predict the best season for San Diego—and explain it to eight-year-old daughter” (better)

Be Specific

- Examples:
  - “Tell me about climate change”
  - “Discuss the economic implications of climate change in developing countries over the next decade.” (better)

Prompt Engineering Techniques

Prompt Type	Description	Example
Zero-Shot Prompt	Give simple and clear instructions without examples. Useful for a quick, general response.	“Summarize this article in 5 bullet points.”
Few-Shot Prompt	Provide a few examples of what you want the AI to mimic. Helps the model learn your desired structure or tone.	“Here are 2 example summaries. Write a third in the same style.”
Instructional Prompt	Include direct commands using verbs like "write", "explain", or "compare."	“Write an executive summary of this memo. Keep it under 100 words.”
Role-Based Prompt	Ask the AI to assume a particular persona or viewpoint. Useful for creativity and domain-specific responses.	“You are an MBA professor preparing a lecture outline...”
Contextual Prompt	Include relevant background or framing before asking a question. Helps the AI tailor responses to a specific audience or setting.	“This text is for an undergrad course on behavioral econ. Rephrase it in simpler language.”
~~Meta-Prompt / System Prompt~~	~~Behind-the-scenes, system-level instructions that set the AI’s behavior, tone, or scope before any user input. Typically written by the platform (e.g., OpenAI). You won't usually don’t see or write these unless you're building your own AI tool.~~	~~“Always respond formally and cite real sources. Never guess.”~~

Building on Conversations

- Many AI systems take the form of a chat window. These chat-based systems are capable of remembering what happened earlier in your conversation without re-establishing context.
- Examples:
  - Please tell me what is Nash's equilibrium?

  <LLM answer>
  - That is great! But tell me in a way that freshman literature major college student understand it

  <LLM Answer>
  - Can you please draw a diagram about it for me?

CoT

Standard Prompting

Model Input

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: The answer is 11.

Q: The cafeteria had 23 apples. If they used 20 to make lunch and bought 6 more, how many apples do they have?

Model Output

A: The answer is 27. ✗

Chain-of-Thought Prompting

Model Input

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: Roger started with 5 balls. 2 cans of 3 tennis balls each is 6 tennis balls. 5 + 6 = 11. The answer is 11.

Q: The cafeteria had 23 apples. If they used 20 to make lunch and bought 6 more, how many apples do they have?

Model Output

A: The cafeteria had 23 apples originally. They used 20 to make lunch. So they had 23 - 20 = 3. They bought 6 more apples, so they have 3 + 6 = 9. The answer is 9. ✓

Examples

You are a college Math teacher. Develop a math activity on statistics. Students will collect data from their peers on a topic of choice, analyze the data using statistical methods, and present their findings using graphs and presentations.

Create a history debate club activity. Assign students different historical figures or events to research. They will then debate from the perspective of their assigned figures or on specific historical issues, using evidence to support their arguments.

You are a science teacher focusing on improving students' lab skills. Write a SMART goal to ensure that all students can independently conduct a basic lab experiment with 90% accuracy by the end of the term.

You are an English teacher looking to enhance students' writing skills. Develop a SMART goal to have students complete a series of weekly journal entries that demonstrate clear improvement in writing coherence and structure over the next quarter.

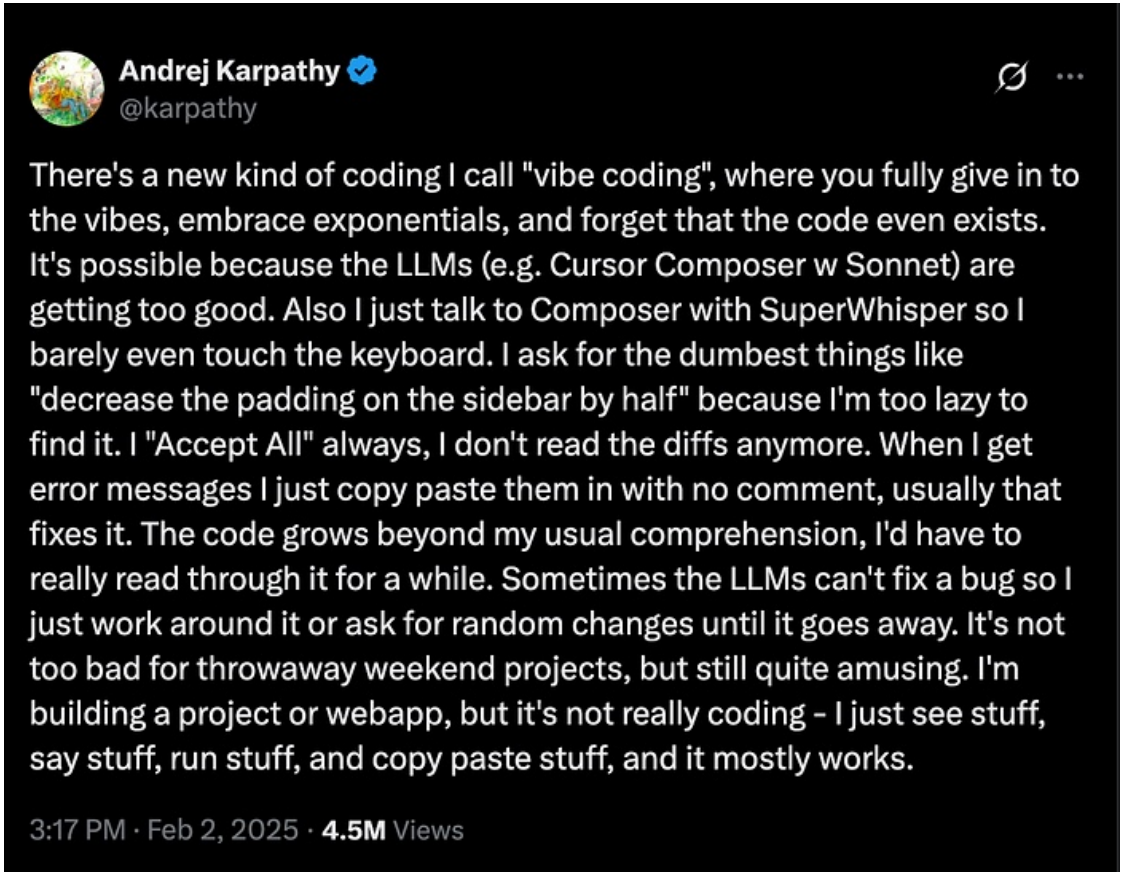
(https://www.weareteachers.com/ai-prompts/)

Aware Limitations of Prompt Engineering

- Focus more on results, less on problems
- Beware of Context Window limit
  - Start a new chat for a new topic
- Beware of AI Hallucinations: AI tools can produce content that is inaccurate, misleading, and even completely made up. Even worse – it will not tell you that the results are made up
- Avoid potential harms: AI falls short of removing biases and producing non-inclusive language, and advocates for iterative development

Introducing Vibe Coding

- Coding by describing the desired outcome (“Vibe”) in natural language.
- AI generates initial code or content; user iteratively refines it.
- Benefits: rapid prototyping, accessibility for non-programmers.



Vibe Coding in Education

- Create interactive websites, applications (exercises and assignments) quickly
- Adapt tone, difficulty, and format to student needs
- Encourages conceptual fluency over syntax memorization

Vibe Coding Steps

- **Workflow**
  - Step 1: Describe the goal
  - Step 2: AI generates the code
  - Step 3: Execute and Observe
  - Step 4:Provide feedback end refine
  - Step 5: Repeat

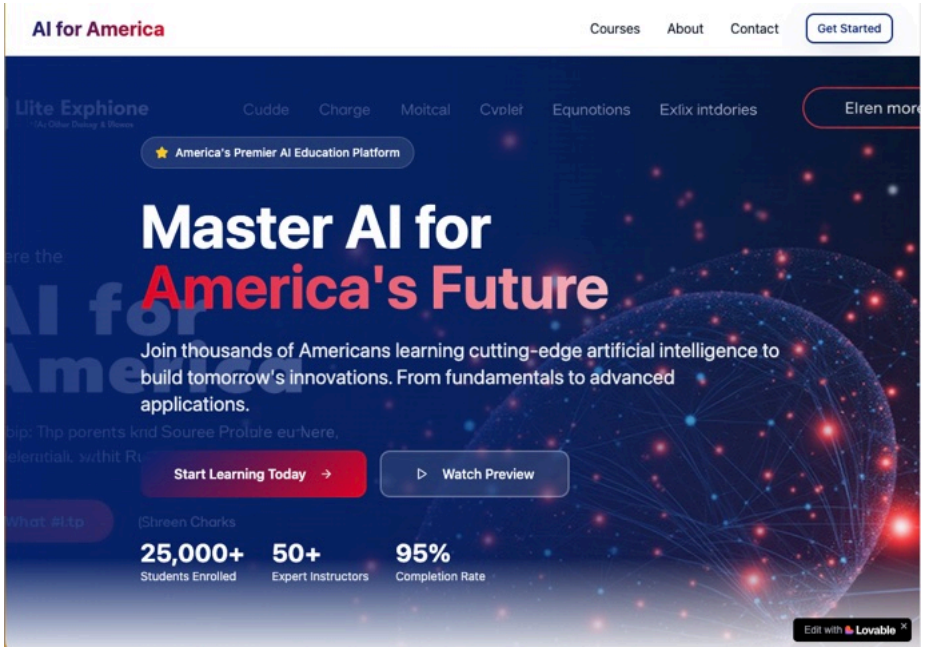
- **Application Lifecycle**
  - Ideation
  - Code Generation
  - Refinement
  - Testing & Validation
  - Deployment

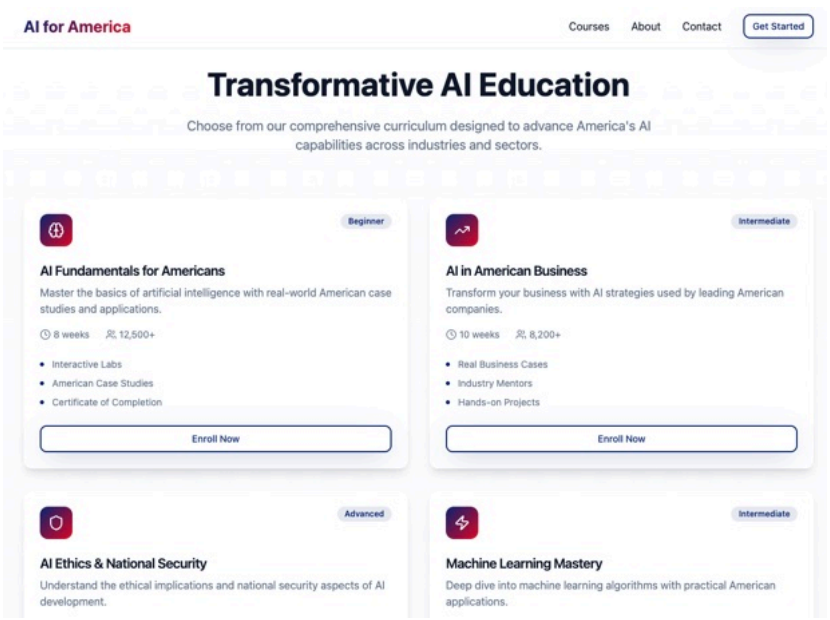
Vibe Coding Tools

- https://Loveable.com
- https://aistudio.google.com/apps
- https://firebase.studio/
- https://bolt.new/
- https://www.tempo.new/

Vibe Coding Example

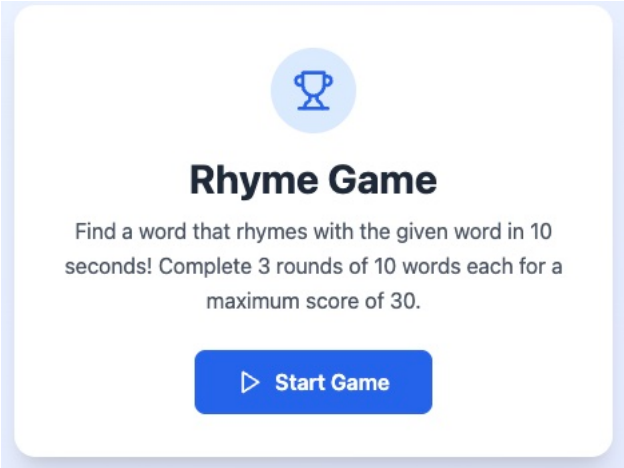
Prompt: Create a course website called AI for America
Result: https://ai-for-america.lovable.app/#courses

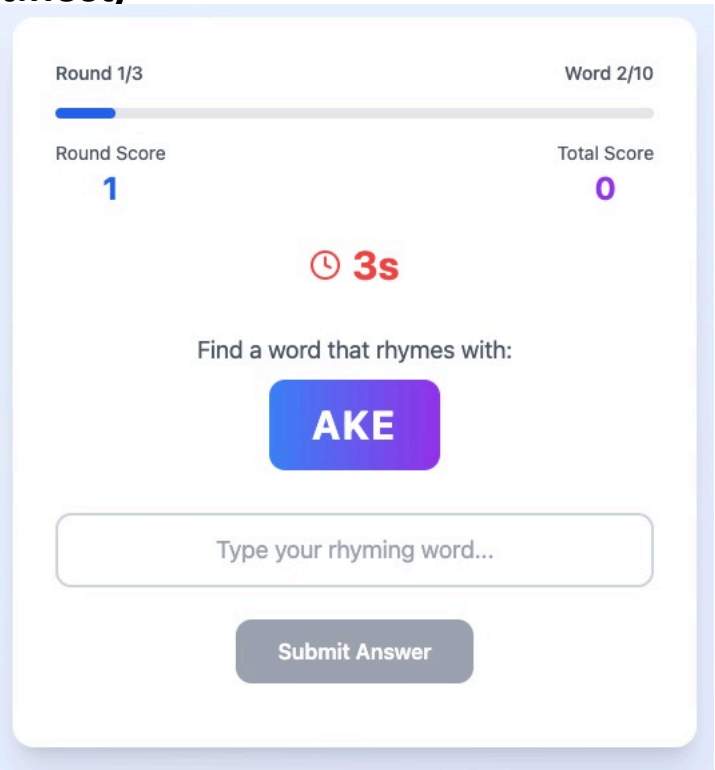




Vibe Coding Example

Prompt: Please create a rhyme game. The rule is the app generates a word and player need to come up with a correct english word witch rhymes it in 10 seconds. if the 10 seconds passed and player can't finish the word, they will get 0. If they finish then they will get 1. This repeats 10 times so the highest score they can is 10. after repeating 3 times, the games ends and show the total score.
Result: https://rhyme-game-applicati-z127.bolt.host/





Risks and Considerations

- AI output may be inaccurate or incomplete; always review
- Security and data privacy concerns—especially with student data
- Over-reliance on AI may hinder critical thinking skills

Hands-On Activity

- Tracks: Lesson Planning, Assignment Design, or Feedback Generation.
- Create a prompt using clarity, context, and examples.

Key Takeaways

- Clear prompts + iteration = more effective AI outputs.
- Both Prompting and Vibe coding accelerates ideation, but requires oversight.
- AI is a partner in creativity, not a replacement for pedagogy.

Resources

Prompt Engineering for Educators: making generative AI work for you

https://educational-innovation.sydney.edu.au/teaching@sydney/prompt-engineering-for-educators-making-generative-ai-work-for-you/

A Comprehensive Guide to Vibe Coding Tools

https://medium.com/madhukarkumar/a-comprehensive-guide-to-vibe-coding-tools-2bd35e2d7b4f

300 Best AI Prompts for K-12 Teachers (Plus Free Printable List)

https://www.weareteachers.com/ai-prompts/