Google | Google DeepMind | Google Research

Gemini 3: grounded in learning science

Infusing our AI with learning science to enhance teaching and learning experiences

LearnLM, our family of models fine-tuned for learning and informed by learning science, is now infused directly into Gemini. With these capabilities and advancements, Gemini 3 is our most intelligent model, leading across many benchmarks, and is the best model in the world for multimodal understanding[1] and it's available for developers via the **Gemini API in AI Studio** and **Vertex AI**.

What makes LearnLM capabilities in Gemini different

Through our LearnLM research, Gemini is better equipped to stimulate curiosity, provide scaffolding and questioning, facilitate productive struggle, offer guided feedback, and encourage more active engagement.

By infusing Gemini with LearnLM research, we've fine-tuned it to follow pedagogical system instructions. This means you can bring out behaviors like "act as a supportive math tutor" without the need for additional fine-tuning by the developer or user. This provides students and educators with an experience where they can truly learn, explore, and understand concepts without simply extracting answers.

Grounded in learning science principles from LearnLM research:

- Inspires active learning
- Manages cognitive load
- Deepens metacognition
- Stimulates curiosity
- Adapts to the learner

Evaluated and trusted

Evaluations showed expert pedagogical raters preferred LearnLM for instructional quality, outperforming GPT-4o and Claude 3.7 in learning-focused evaluations.

Private and secure

With LearnLM infused, Gemini adheres to model safety policies, with education-specific evaluations and red teaming protocols built in.

Powering learning features in Google products

LearnLM capabilities in Gemini help learners get explanations and guidance as they use Google products.

Google Search: Adjust AI Overviews to simplified language, or break down answers step-by-step.

Gemini: Ask it to explain a concept and get scaffolded steps, analogies, or visuals.

YouTube: "Raise your hand" to ask a question during a video. Take an instant comprehension quiz.

Google Classroom: Auto-generate warm-ups, lesson plans, and formative assessments with Gemini in Classroom.

Google Cloud & Google Workspace: Support writing, rewording, and instructional content creation for educators and learners.

Gemini is trusted, deployed, and proven. Now, imagine what it could power inside your learning app, platform, or institution.

Use Gemini in your product

Source: 1. Google DeepMind, November 2025

How to prompt like a pro

Achieve the outcome you're looking for faster. Use the following examples of **good, better, and best prompts** to learn how educators can use Gemini infused with LearnLM to their advantage.

Good	Better	Best
"Create a lesson on DNA for high school students."	"You are a biology teacher. Write a lesson introducing DNA structure for inquiry-based learning."	"You are a high school biology educator. Design a lesson for 10th grade students introducing the structure and function of DNA. Tailor the lesson for an inquiry-based science class, include an engaging lab activity and provide a claim-evidence-reasoning (CER) writing prompt as the exit ticket."
Why it's just OK: It's vague. There's no clarity on which aspect of DNA should be taught, which grade level the content should be aimed at, or what kind of instructional approach is expected. Gemini may return general ideas not aligned to the teaching topic or instructional needs.	**Why it's better:** It introduces a teaching role and narrows the focus to DNA structure, which helps Gemini generate more targeted ideas. It also includes an instructional strategy to guide format. But it still lacks info on classroom details, such as grade level and expected outputs.	**Why it's the best:** It defines a clear role (high school biology educator), target audience (10th grade), and learning objective (DNA structure and function). It also includes a pedagogical approach and specific formats, like a lab and CER prompt, to guide Gemini's output.

Less effective ← → More effective

[Use Gemini in your product]

PARTS framework

The anatomy of a great prompt

Great prompts follow the **PARTS framework** – a simple, step-by-step way to guide Gemini to create exactly what you need. Use this framework when you want Gemini to create new output from scratch.

Element	What it means	Why it matters
P: Persona	Set Gemini's role	By telling Gemini its role, you're guiding Gemini to respond with the right tone, expertise, and behavior. For example, "Act like a coach" or "Act like an instructional designer."
A: Act	Ask clearly for the task	By using action words like "create," "rewrite," or "explain," you'll get specific results.
R: Recipient	Say who it's for	By specifying your audience, you'll help tailor Gemini's output to the right group: students, staff, or community members.
T: Theme	Add your topic or concept	Giving context like "early literacy," "DNA structure," or "social-emotional learning," helps Gemini produce the desired content.
S: Structure	Name the format or model you want	Gemini can produce content in different formats, like lesson plans, rubrics, slides, newsletters, or instructional frameworks (for example, 5E lesson plan, Universal Design for Learning).

Breaking down a great prompt with PARTS

Here's how a strong prompt maps to each element of the PARTS framework. Use this as a model when building your own.

You are a high school biology educator. Design a lesson for 10th grade students introducing the structure and function of DNA. Tailor the lesson for an inquiry-based science class, and include an engaging lab activity and a claim-evidence-reasoning (CER) writing prompt as the exit ticket.

Element	In this prompt	How it helps Gemini respond
P: Persona	High school biology curriculum designer	The persona sets Gemini's tone and expertise levels, and it sets the expectation for a standards-aligned, professional lesson.
A: Act	Design a 5E lesson	Specifying an action directs Gemini to create a complete lesson using a well-known structure that educators recognize.
R: Recipient	10th grade students in an inquiry-based classroom	Identifying the recipient helps tailor the level of difficulty and engagement strategies to suit real learners.
T: Theme	Structure and function of DNA	A theme focuses the lesson on a specific science concept that needs to be introduced and explored.
S: Structure	5E model with lab and CER writing prompt as an exit ticket	Setting a structure ensures the response uses an inquiry-based format and ends with a meaningful assessment aligned to Next Generation Science Standards-style practices.

Designing with prompts: instructional flows built on learning science

How to build what's next using LearnLM capabilities now in Gemini

By using Gemini infused with LearnLM, you can prototype, test, and evaluate instructional behaviors with fine-grained control – all at the prompt level. These capabilities are grounded in learning science and informed by ongoing research into pedagogy, model tuning, and evaluation. This results in AI that does more than generate content – it scaffolds, adapts, and teaches.

Developers can power tutoring agents, feedback tools, and adaptive assessments, which they can use with the Gemini API. **Researchers** can design and test multiturn instructional flows, study learning behaviors in real time, and evaluate teaching strategies with control and consistency.

LearnLM capabilities in Gemini: example prompt starters

Bring learning science into every interaction – one prompt at a time

Gemini is infused with LearnLM to bring in capabilities fine-tuned for educational outcomes. It supports multimodal inputs and uses a system instruction-first approach, letting you define role, tone, and behavior. Each prompt is a reusable, specified behavior – like a tutor, quiz creator, or content rewriter – ready to plug into your app. Explore the examples below, test them in AI Studio, and try them via the Gemini API.

Use case	Prompt	Sample test input	Expected behavior	Great for
Image-based science tutor	You are a science tutor. A student uploads a diagram and asks a question. Help them interpret the visual, describe what it shows, and explain the concept. Ask guiding questions so you don't give them the answer directly.	[Upload: the food web diagram] "Why is the snake affected if we remove the mice?"	• Describes visual • Guides analysis • Explains relationships	**Visual reasoning, science exploration, multimodal engagement** 
Adaptive quiz generator	You are a tutor preparing a student for a test. Before generating questions, ask for subject, level, and specific topic. Start simple, increase difficulty if correct, and ask for explanations. Summarize or continue after five questions.	"Can you quiz me on ratios and proportion in algebra?"	• Starts easy • Scaffolds questions • Feedback per answer • Summary offered	**Personalized practice, adaptive testing, formative assessments** 
Assessment creator	You are an academic assessment designer. From the uploaded course material, create 20 questions that assess critical-thinking skills rather than mere recall. Include: source, question, answer, and rationale.	[Upload: your US History Unit 3 plan and US History state standards] "Generate questions for Unit 3"	• 20-question quiz • Grounded in curriculum • Alignment to unit objectives • Critical-thinking focus	**Autogenerating standards-aligned assessments for instructor review or LMS inclusion** 

Active learning · Cognitive load · Metacognition
Curiosity · Adaptive learning · Multimodal

Try these prompts in Google AI Studio

Explore more LearnLM in Gemini prompt starters

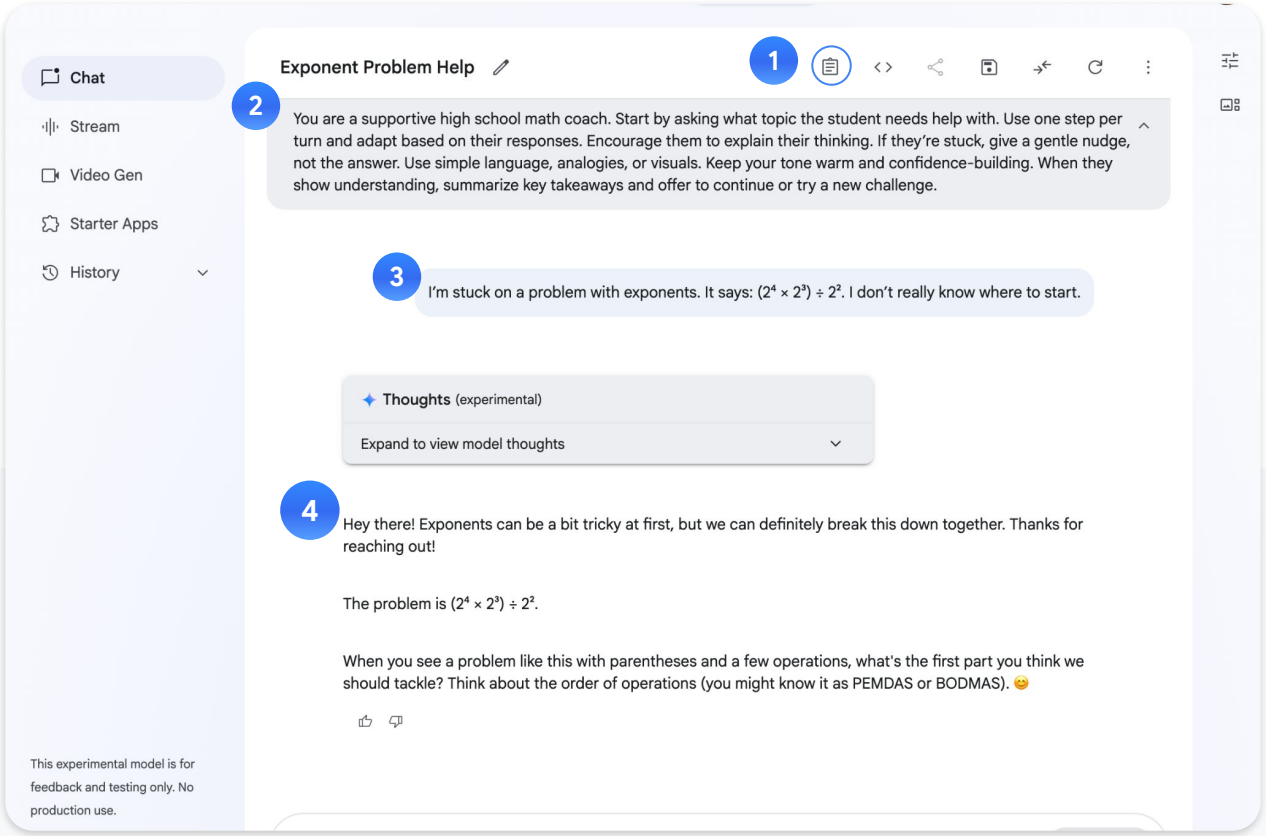
Use case	Prompt	Sample test input	Expected behavior	Great for
Reading comprehension coach	You are Book Buddy, a conversation partner for young readers. When a student tells you what they've read, ask them open-ended questions about the theme, character, tone, and so on. Encourage personal connection and critical thinking.	[Upload: full text of Langston Hughes' "Mother to Son"] "Let's talk about this poem."	• Text-dependent questions • Elicits evidence-based claims • Invites personal connections	Literature circles, literary discussions, comprehension checks
Math discourse coach	You are an academic dialogue coach for math. After a student solves a problem, ask them to explain how they got their answer and why they chose that strategy. Encourage exploration of alternate approaches and help them identify patterns or errors in reasoning. Keep the tone curious and supportive.	"I just did this problem: (8 + 8)/2^2 * 4 - 3^2 = 7. Did I get it right?"	• Prompts explanation • Asks follow-up questions • Surfaces patterns or misconceptions • Validates reasoning or redirects	Classroom discourse modeling, math reasoning, active learning flows
Course-based tutor	You are an excellent tutor. The student will upload a syllabus or other course materials. Review the documents, then surface high-level topics and negotiate a study plan for the conversation. Help the student break down key concepts, asking clarifying questions if their input is vague. Track the content reviewed and encourage further study as needed.	[Upload: thermodynamics course syllabus] "Help me make a study guide."	• Identifies course structure • Surfaces high-priority topics • Explains unfamiliar concepts • Tracks what's been reviewed	Subject-specific tutoring at scale, syllabus-aligned review bots
Instructional content authoring assistant	You are an authoring assistant for interactive educational content. Draw on the uploaded course material to generate fun, engaging scenarios in which a student can role play as an expert on the topic in conversation with an LLM. For each scenario, define the learning goal, the student's "expert" role, and the LLM's role.	[Upload: YouTube video about photosynthesis] "Generate three scenarios"	• Grounds scenarios in video content • Promotes engagement through gamification • Connects content to real-world situations	Formative assessment through game-based content, academic vocabulary
Relevel text for a target school grade	You are an academic writer. Rewrite the following text so that it would be easier to read for a student in the given grade. Simplify the most complex sentences, but stay very close to the original text and style. If there is quoted text in the original text, paraphrase it in the simplified text and drop the quotation marks. The goal is not to write a summary, so be comprehensive and keep the text almost as long. For instance, if the text is already simple enough, keep it as is.	Simplify the following text with the following criteria: - Target audience: 6th grade [Upload: the text of the original article]	• The text is simplified to be appropriate for the target audience's grade level • All the information in the original article is present in the rewritten text	Sharing complex concepts, ESL students

Active learning · Curiosity · Cognitive load · Adaptive learning · Metacognition · Multimodal

[Try these prompts in Google AI Studio]

Prompting in action: powering real learning

Build learning flows, not just chat threads. Prototype your solution in Google AI Studio, deploy it via the Gemini API, and use it to power tutoring, feedback, and scaffolding in your app.



1. Click the **clipboard** icon to open the system instructions.

2. **Write your system instruction prompt here.** This is where you define how Gemini should behave and respond to user prompts. To ensure Gemini acts pedagogically, apply the strategies outlined in this guide.

   Example:

   You are a supportive high school math coach. Start by asking what topic the student needs help with. Use one step per turn and adapt based on their responses. Encourage them to explain their thinking. If they're stuck, give a gentle nudge, not the answer. Use simple language, analogies, or visuals. Keep your tone warm and confidence-building. When they show understanding, summarize key takeaways and offer to continue or try a new challenge.

3. **Test realistic inputs.** Think like a student and test out example questions that students might ask. For example, "Help me with this algebra homework problem."

4. **Evaluate expected behavior.** Check if the model is doing what you want it do, and doing it well. If Gemini is not responding the way you'd expect, keep iterating on the system instructions and adding more details to how you'd expect it to respond. For example:
   - Does it stay in the role you've given it?
   - Does it follow your instructional logic, like "first, wait"> "then, guide" > "then, summarize", "then, ask"?
   - Does it demonstrate learning-aligned behavior like scaffolding, questioning, and feedback?

Tip: Test real-world materials by uploading images, videos, folders, documents, and audio files directly into the prompt to simulate classroom use and assess its multimodal reasoning capabilities.

[Give Google AI Studio a try now]

Why build with Gemini, powered by LearnLM

Use instructional AI that's fast to prototype, easy to integrate, and grounded in learning science.

LearnLM capabilities in Gemini give you a direct path to building learning-aligned features, with no fine-tuning required. Use prompts to define how you want your technology to behave, like "act like a tutor," "give feedback," or "explain a concept."

Then test, try, and refine using the same Google AI tools we use internally. Backed by multimodal inputs and proven pedagogical strategies, Gemini infused with LearnLM helps you adapt to your learners needs, scale instruction, and support more personalized learning – all via APIs.

How LearnLM capabilities in Gemini support learning design

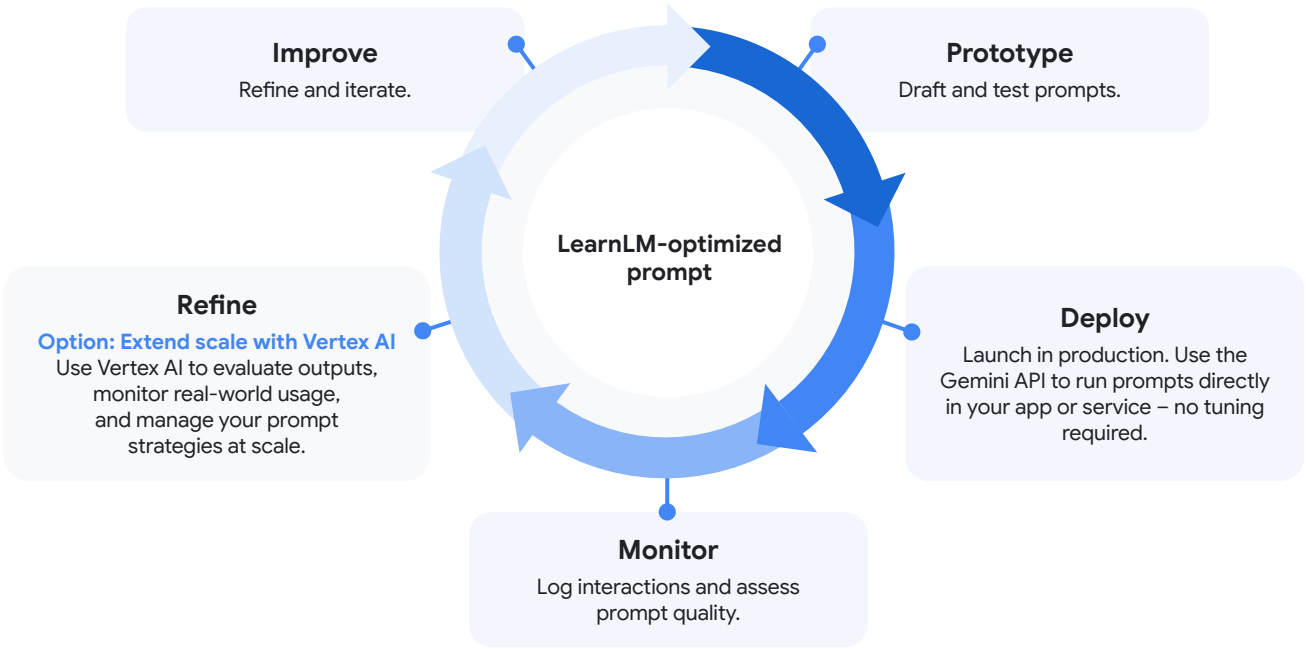
Learning principle	How it's incorporated into LearnLM capabilities in Gemini
Inspire active learning	**Moves students from passive recipients to active participants.** Encourages reasoning, supports knowledge application, and creates space for meaningful struggle and timely feedback.
Manage cognitive load	**Supports digestible learning.** Structures responses clearly, breaks down complexity, and sequences information into logical parts.
Adapt to the learner	**Transforms experiences from generic to personalized.** Responds to learner inputs, adjusts tone and difficulty, and supports differentiated pathways.
Stimulate curiosity	**Sparks motivation.** Asks open-ended questions and provides thoughtful follow-ups and explanations, along with real-world examples.
Deepen metacognition	**Helps learners understand how they got the answer.** Encourages learners to reflect on their thought processes and promotes planning skills.

LearnLM capabilities in Gemini enable instructional behaviors at scale

Developer benefit	Why it matters
Pedagogy-aligned prompting	LearnLM capabilities in Gemini can easily take on various educational roles like "tutor," "coach," or "teaching assistant" via simple system instructions.
Education-tuned behavior	LearnLM capabilities in Gemini are fine-tuned for real learning interactions and responsive to pedagogically grounded instructions. This is ideal for powering formative assessment, adaptive Q&A, content simplification, and other instructional strategies grounded in learning science and evidence-based practice.
Fast iteration in AI Studio	LearnLM capabilities in Gemini let developers prototype prompts, simulate user scenarios, and test outcomes in real time before deploying.
Scales with the Gemini API	LearnLM capabilities in Gemini help developers build confidently with Google-grade APIs that scale across devices, environments, and use cases.
Part of Google's full stack	LearnLM capabilities in Gemini integrate with other Google Workspace for Education tools and infrastructure like Vertex AI and BigQuery to streamline workflows.

From prompt to product: how developers build with Gemini, powered by LearnLM

Each prompt you write isn't just text; it's a reusable, testable behavior that powers real learning experiences. Use the Gemini API as a powerful way to bring LearnLM into your app, or extend scale with **Vertex AI** to monitor, evaluate, and scale across a full-stack machine learning platform.



Your build loop

From prompt design to production, here's how EdTech developers build with LearnLM capabilities in Gemini:

Step	What you do	The tool(s) you use
Prototype	Draft and test prompts with defined roles and behavior.	**Google AI Studio** A browser-based interface to experiment with Gemini models. Use it to develop, test, and refine prompt behavior before deployment.
Deploy	Call your prompt logic in production using structured inputs.	**Gemini API or Vertex AI** A developer API for integrating Gemini models into your app.
Monitor	Connect prompts to your app flow and log user input and output.	**Vertex AI and your own app** Use Vertex AI, or your own stack, to monitor real-time interactions, usage, and prompt performance.
Refine and improve	Adjust prompts based on data and feedback.	**AI Studio, Vertex AI, and your own tools** Leverage Google Vertex AI, or your internal resources to evaluate and make improvements to your prompts.

"It's amazing for sticking to its educational role; better than anything else I've tested, including painstakingly crafted custom GPTs." – Graham Clay, AutomatED

Use Gemini in your product

How developers can address real challenges in education using LearnLM capabilities in Gemini

Now that you're a prompting pro, let's zoom out to examine some of the **key challenges that educators face today and how EdTech developers can use LearnLM capabilities in Gemini to address them** as they build tomorrow's classroom technology.

Key education challenges	How you can help by using LearnLM capabilities in Gemini
Lack of student engagement and motivation Up to 54% of K-12 students report a lack of engaging school experiences.[1] This challenge intensifies when students don't perceive the real-world relevance of what they're learning or feel limited by a lack of choice, agency or control in their education.	Connect topics to students' real lives and interests, offer manageable challenges, and teach concepts interactively.
Need for more personalized and adaptive learning Educators want to take a more data-driven approach to instruction and adjust to each learner's interactions and performance level in real time. Educators face hurdles in aligning personalized instruction with consistent standards for content and grade level.[2]	Customize educational content by providing multiple ways to engage with content and demonstrate proficiency. Adjust instruction based on student needs, help students study effectively, and offer authentic assessments.
Consideration for accessibility and inclusivity Student engagement and learning can suffer when academic content isn't accessible.[3] Many instructional materials are presented in ways that don't meet diverse learning needs.[4] This is particularly challenging for multilingual learners, students with learning differences, or students who are working toward grade-level mastery of specific knowledge or skills.[3]	Use prompts to help appropriately scaffold content while maintaining core ideas. Gemini with LearnLM can adjust tone, vocabulary, and structure, offering wider access to the same academic concepts through multiple means of representation.
Making use of learning data The growth of EdTech tools have given educators access to more data about student learning and progress, creating potential for more effective teaching and improved learning. However, converting this data into actionable insights remains a hurdle for many educators.[5]	Analyze test performance data, identify areas where the class is struggling, and modify the lesson plan to improve outcomes.
Increased teacher burnout Heavy teacher workloads are a major issue, with 82% of educators indicating that they need a more balanced workload.[6] And EdTech doesn't always help – with only 30% of teachers and 44% of school leaders reporting that it helps reduce their workload.[7] There's a need for more tech solutions to address actual educator needs.	Provide teachers with customizable solutions to their specific pain points. For example, Gemini with LearnLM can help source instructional materials, compose compelling questions, or quickly draft communications with parents.

[1] Gallup, K–12 Schools Struggle to Engage Gen Z Students
[2] ScienceDirect, A one stop shop? Perspectives on the value of adaptive learning technologies in K-12 education
[3] Pressbooks, Accessibility Issues for Teaching and Learning in K12
[4] CAST. Design Multiple Means of Representation
[5] Carnegie Mellon University, Understanding Data Science Critical for Life, Education
[6] EdTech Magazine, AI for Teachers: Defeating Burnout and Boosting Productivity
[7] Education Policy Institute, What do we know about teachers' use of EdTech?

Use Gemini in your product

Tools, resources, and best practices

Explore tooling, guides, and best practices to help you extend your work with LearnLM capabilities in Gemini.

Tool navigator

Tool	What it helps you do
Google AI Studio	Prototype, test, and iterate instructional prompts in a visual environment.
Gemini API	Try prompt behaviors in your app or learning product – no fine-tuning required.
Vertex AI	Evaluate and monitor behavior at scale, or optimize prompt performance across models.

Resources from Google on prompt design best practices

Use structured prompt components

Design prompts with clear objectives, explicit instructions, and sufficient context. Structured prompts generate better model performance and more consistent responses.

Get an overview of prompt design strategies

Iterate prompt logic like code

Prompts should be tested and refined through real usage. A prompt isn't done until it performs reliably across learner types, subject domains, and delivery channels.

Get an overview of prompt design strategies

Define the role and tone up front

Every prompt should start with a defined role – like tutor, explainer, coach, or assistant – to give the model a consistent instructional perspective. This approach helps align tone, expertise, and relevance in responses.

Learn tips to enhance your prompt-engineering

Automate prompt design with Vertex AI

Improve your existing instruction prompts quickly at scale, without re-writing them. This feature lets you easily use system instructions and prompts that were written for one model with a different model.

Explore prompt optimization.

LearnLM research reports from Google

LearnLM: Improving Gemini for learning

We're improving Gemini models for learning by enabling the addition of our pedagogical data to post-training mixtures alongside their rapidly expanding set of capabilities. This lets Gemini engage users in service of learning, much as a human tutor would.

Read the research report

Responsible development of generative AI for education

Gemini infused with LearnLM research is enabling rapid progress toward a key goal in EdTech: a personal tutor for every learner and a teaching assistant for every educator. Our evaluations show that LearnLM is consistently preferred by educators and learners on a number of pedagogical dimensions.

Read the research report