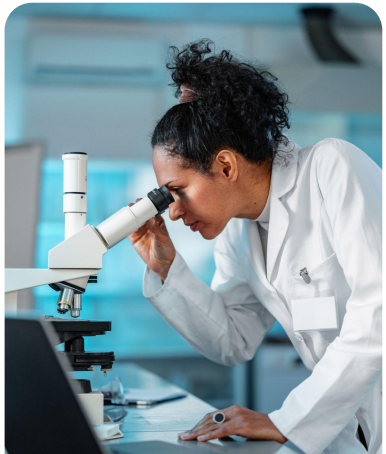
Google

AI & Personalized Learning

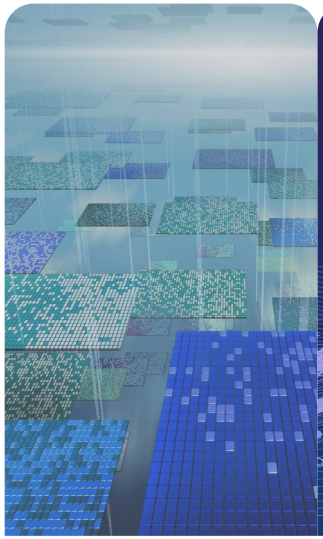
Yossi Matias

Vice President, Google &
Head of Google Research



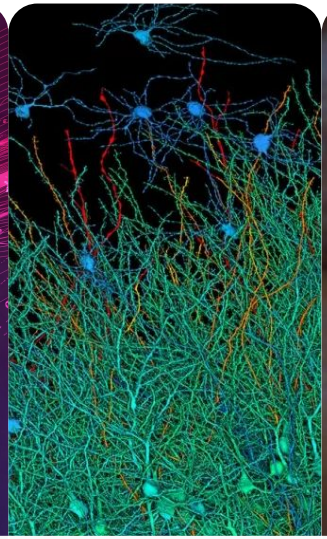
Google Research

Driving breakthrough research from discovery to impact across our business and products, science, and society



Foundational ML & Algos

GenAI Foundations

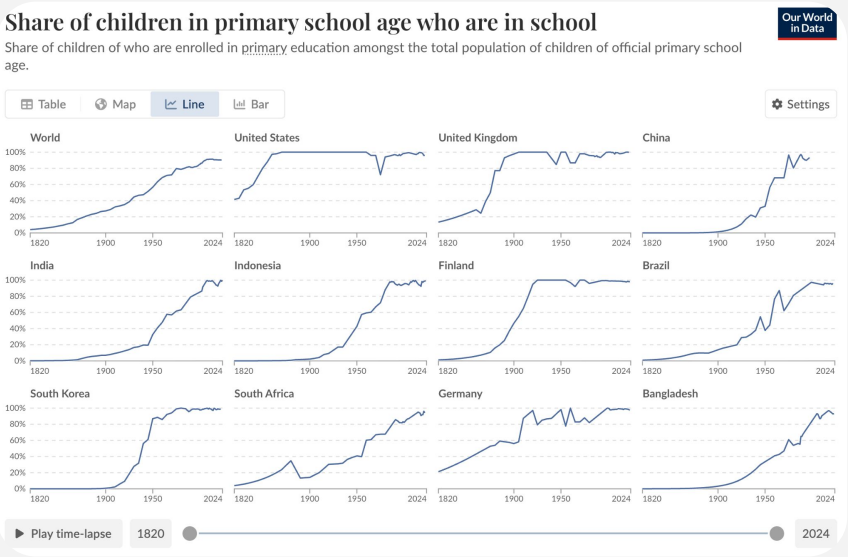


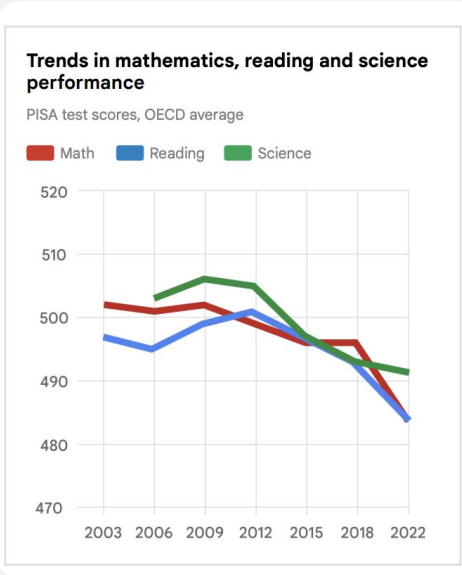
AI for Science

AI & Society

Quantum AI


We believe AI can unlock human potential
— helping everyone be their best.





unesco

44

million additional teachers

are needed to achieve universal primary and secondary education by 2030

Google Research

While the internet solved for access to information, AI provides the next great leap.

Our pedagogical principles are at the heart of these efforts.

Personalization

The goal of personalization isn't new, but AI opens up new ways to bring it to life at scale.

Personalization can help target learners at the right level to close understanding gaps and help ensure that learning differences do not determine one's potential.

Active learning

AI promises to bring the very best of what we know about how people learn into everyday teaching,

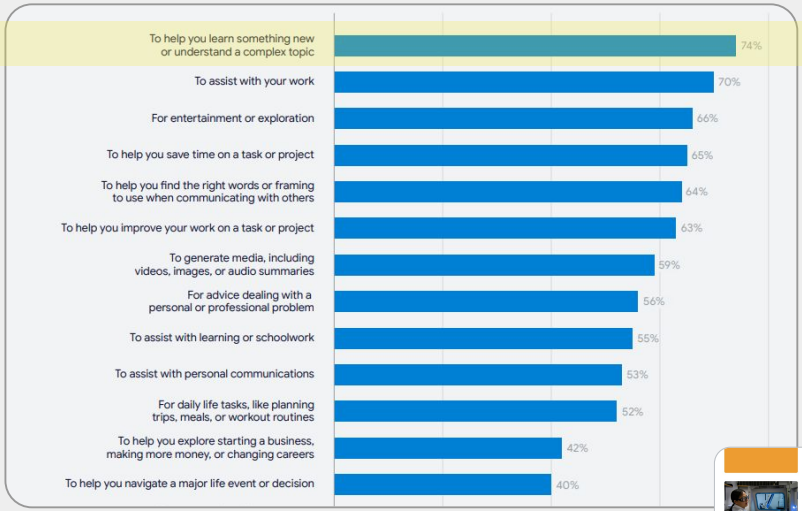
AI systems can spark active participation, encouraging deep practice and review, and weaving in the benefits of spaced repetition.

Teacher tools

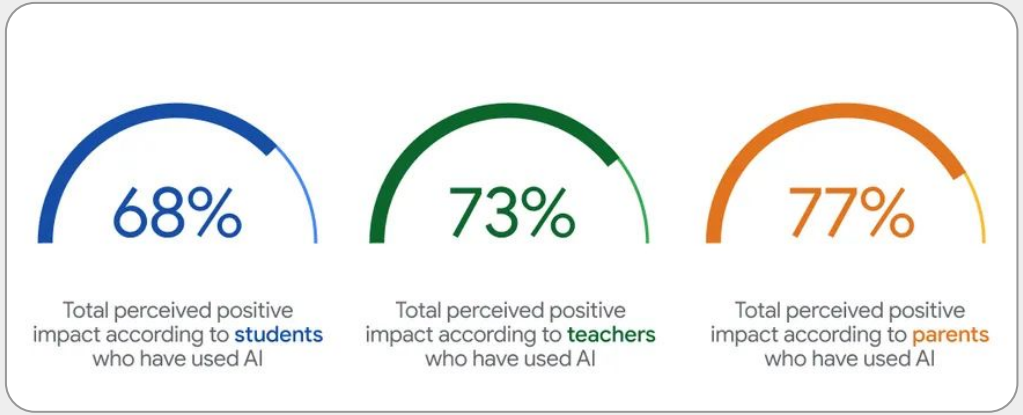
AI can free up precious time for teachers to focus on meaningful human and social interaction with students.

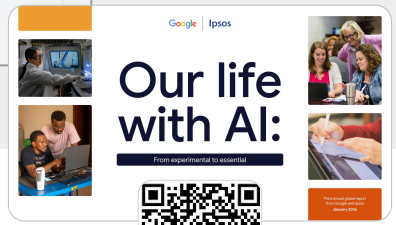
AI can assist busy teachers across a range of areas, spanning from deep research and content creation, to activity planning and administrative tasks.

74% use AI to help them learn something new or understand a complex topic



Perceived positive impact on the way we learn





- Using AI to drive active, deep understanding, moving beyond passive information consumption
- AI can democratize personalized, high-impact tutoring, as an inexpensive and always-available coach
- AI as a powerful teaching assistant that frees educators for human connection while helping remove global barriers

Generative AI & Learning

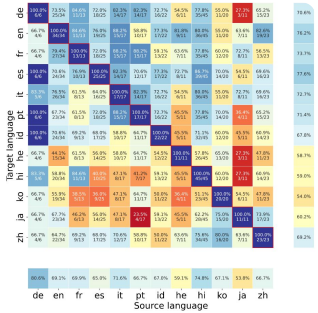
Google Research

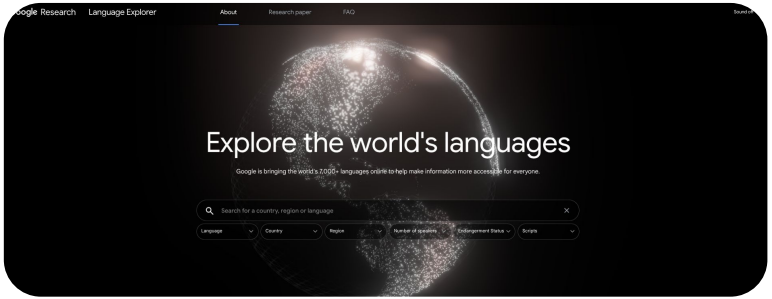
Building on our foundational Gen AI research

Multilinguality

4b

People speak a language other than English

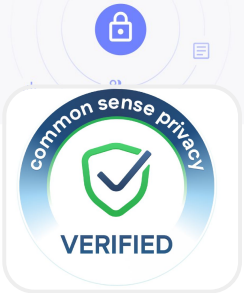




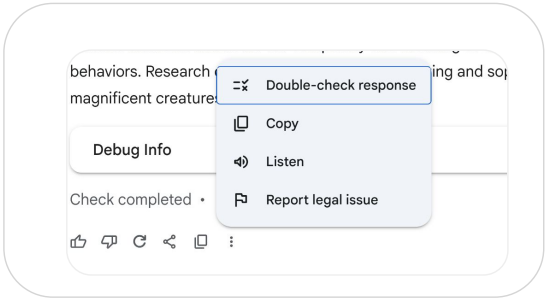
Privacy

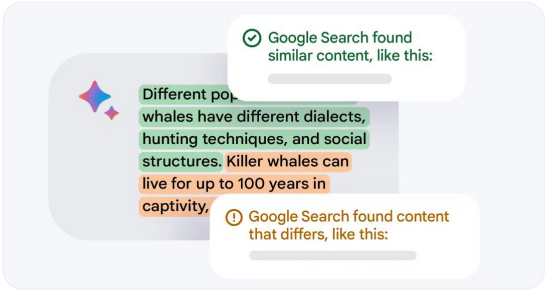
We value your privacy and do not use your personal data to train NotebookLM.

NotebookLM does not use your personal data, including your source uploads, queries, and the responses from the model for training.



Factuality






Art of teaching &
Science of learning

Art of teaching & Science of learning

Unlocking learning science

Making learning personal for students

AI as a helping hand for educators

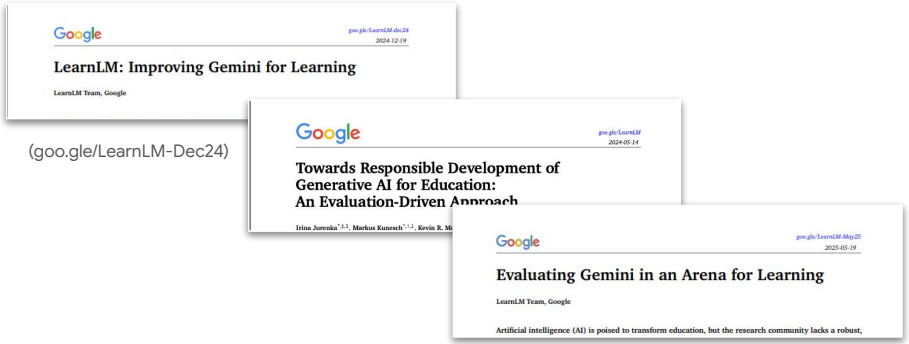
Promoting responsible AI Literacy

The Opportunity

Unlocking learning science

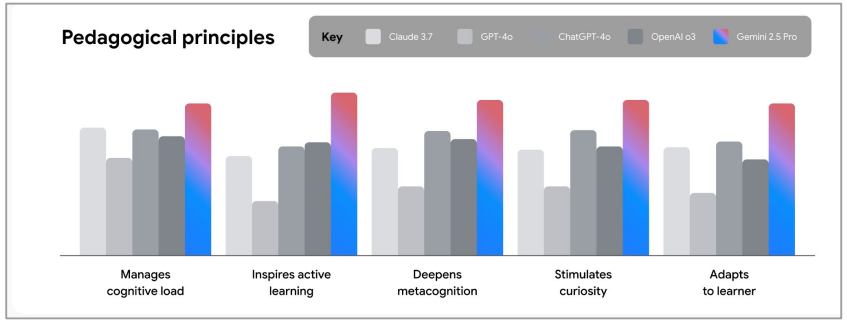
Unlocking Learning Science

Infusing Gemini with Learning Science



(goo.gle/LearnLM-Dec24)

(goo.gle/LearnLM-May25)



Inspire active learning

Help the learner acquire and organize knowledge

Manage cognitive load

Present relevant, well-structured information

Deepen metacognition

Plan, monitor, and help learners reflect on progress

Stimulate curiosity

Inspire engagement through the learning journey

Adapt to the learner

Dynamically adjust to learners' goals & needs

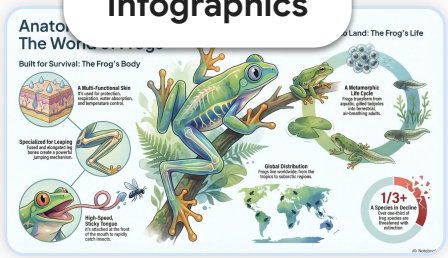
Unlocking Learning Science

The Opportunity

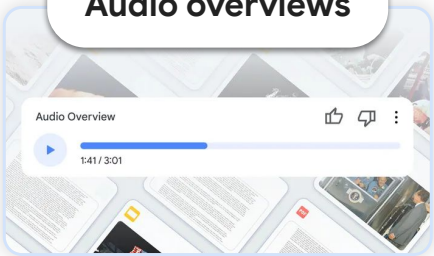
Making learning personal for students

NotebookLM

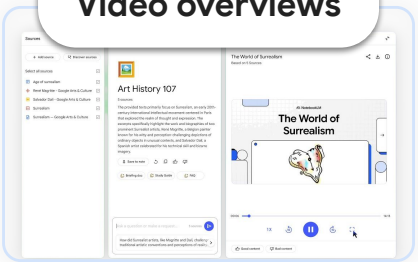
Infographics



Audio overviews



Video overviews

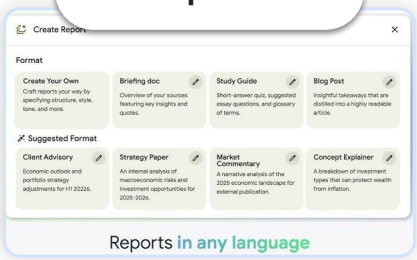


Slide decks

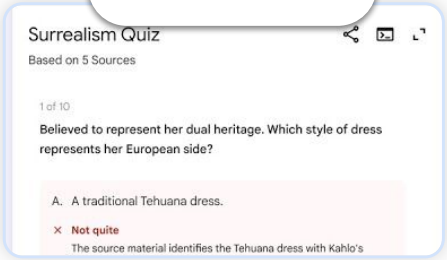
Mind Map

Flashcards

Reports

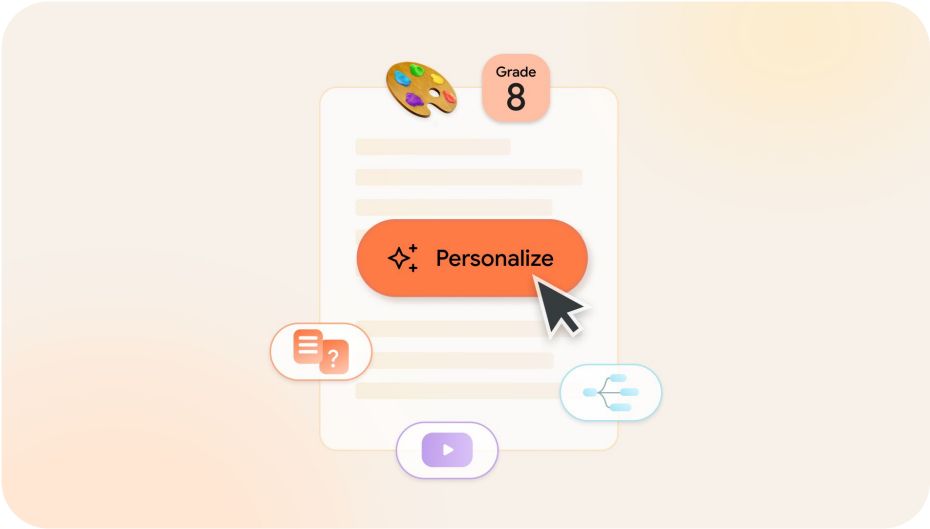


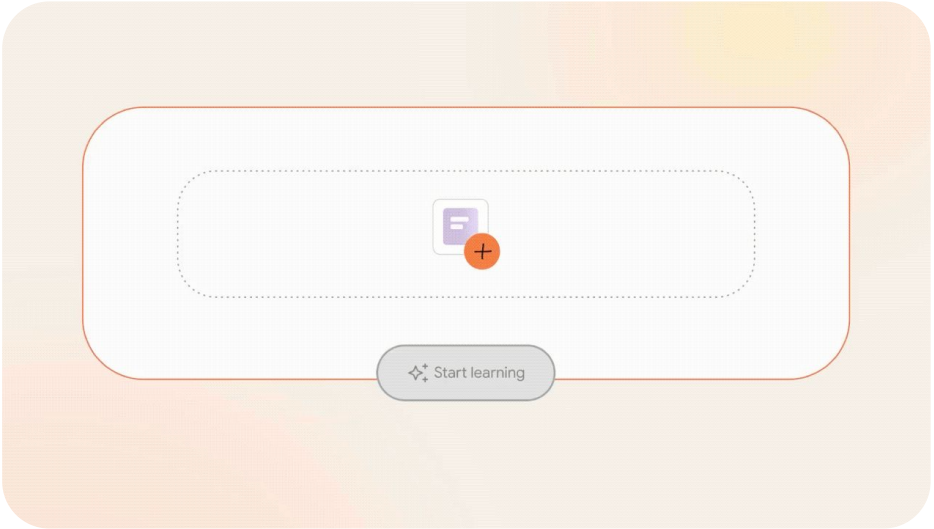
Quiz



Making Learning Personal

Re-imagining textbooks





Learn Your Way

transforms content into a dynamic & engaging learning experience tailored for every learner

Google

2025-10-01

Towards an AI-Augmented Textbook

LearnLM Team, Google

Textbooks are a cornerstone of education, but they have a fundamental limitation: they are a one-size-fits-all medium. Any new material or alternative representation requires arduous human effort, so that textbooks cannot be adapted in a scalable manner. We present an approach for transforming and augmenting textbooks using generative AI, adding layers of multiple representations and personalization while maintaining content integrity and quality. We refer to the system built with this approach as Learn Your Way. We report pedagogical evaluations of the different transformations and augmentations, and present the results of a a randomized control trial, highlighting the advantages of learning with Learn Your Way over regular textbook usage.

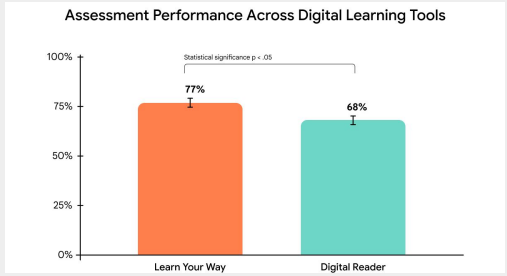
Keywords: Personalized learning, generative education, content transformations

1. Introduction

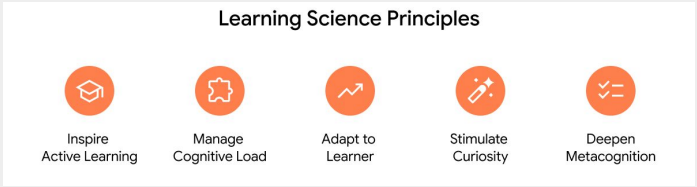
Recent advances in generative Artificial Intelligence (Gen-AI) have the potential to revolutionize education, but this potential is yet to be realized in full. It requires a responsible, multidisciplinary approach to weave together learning science and cutting edge technology. In this work, we focus on a central aspect of the current learning journey: exploring textbook material. Traditionally, every school selects several textbooks that are meant for use by all learners. The textbooks, by definition, are inflexible and not adaptive, as it is impractical to manually create a version for every audience, and certainly not one that would adapt to individual user needs. Here we argue that in the age of Gen-AI, this notion of a flexible and personalized textbook is in fact within reach. Specifically, we show how textbooks can be transformed into a richer and more personalized form, while maintaining the integrity of the original content, and adding layers that promote effective learning.

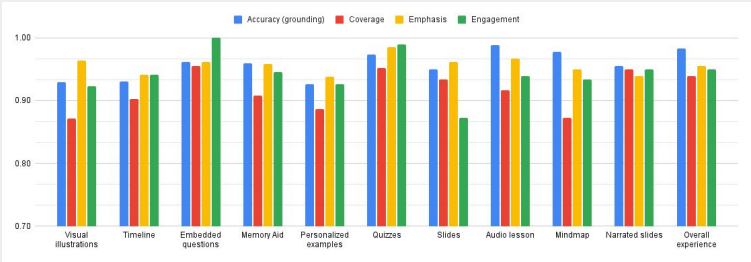
Our textbook augmentation approach takes as input a textbook segment or chapters and uses them as the basis for extensive generated content, practice and evaluation. Our approach rests on two key concepts that underlie the corresponding augmentations of the original content: multiple representations and personalization. We propose a two step AI generation scheme whereby the original text is first personalized, and then transformed into a range of presentation forms and assessment components. A key desiderata in this process is that content is adequately aligned with the source and curriculum, and that the presentation is engaging and pedagogically effective. We implement our approach in an experimental learning experience that we call Learn Your Way.

Technical report



Efficacy study





Pedagogical evaluation

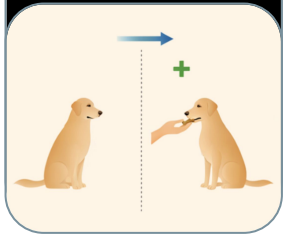
Making Learning Personal

Psychology

Theories of Self-Development

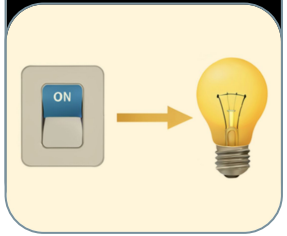
Psychology

What is Learning?



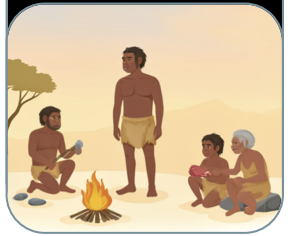
Philosophy

Logical Statements



History

Early Human Evolution and Migration



History

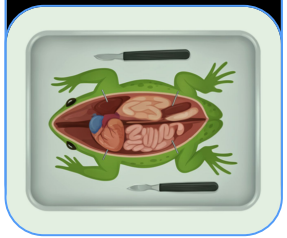
The Ancient Roman Economy

Biology

Disruptions in the Immune System

Health

Overview of Anatomy & Physiology



Economics

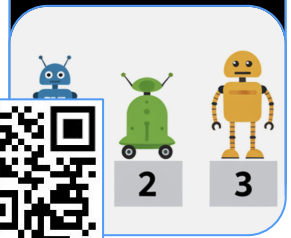
An Overview of Economic Systems

Economics

Microeconomics & Macroeconomics

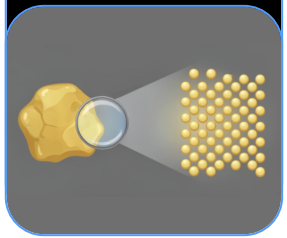
Computer Science

Intro to data structures & algorithms



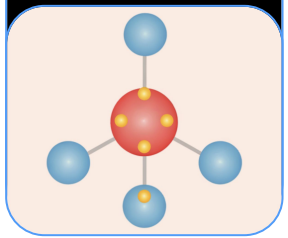
Chemistry

Atoms and Molecules



Chemistry

Carbon



Making Learning Personal

The Opportunity

A Helping Hand for Educators

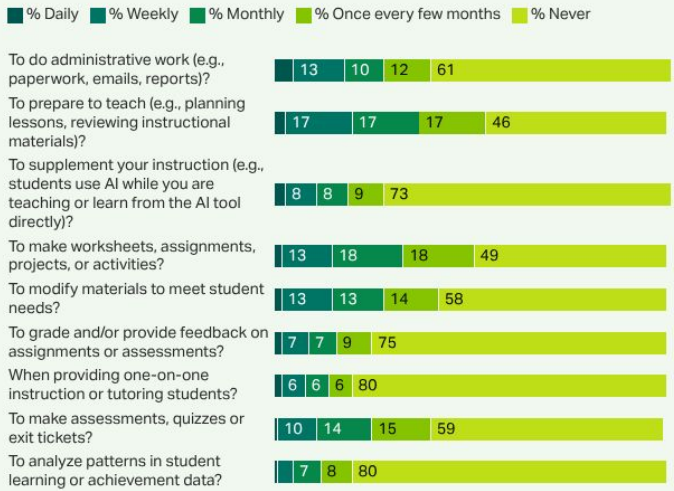
GALLUP Workplace Advisory CliftonStrengths Research & Polling Cours

Three in 10 Teachers Use AI Weekly, Saving Six Weeks a Year

Most teachers who use AI tools say they improve the quality of their work

Frequency of Using AI Tools for Various Teaching Tasks

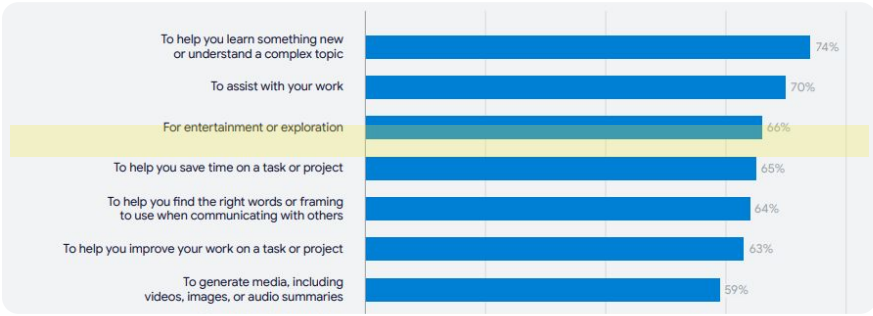
How often do you use AI tools ...?



Walton Family Foundation-Gallup Teaching for Tomorrow Study
March 18-April 11, 2025

Get the data • Download image GALLUP

65% of educators say they're saving time by using AI

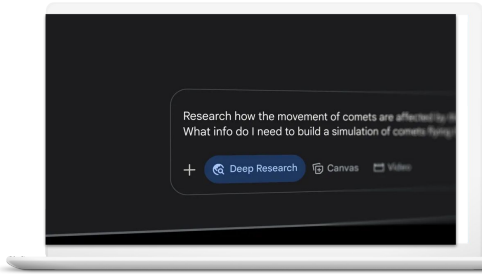


Participating teachers reported saving an average of 10 hours per week with the help of Gemini

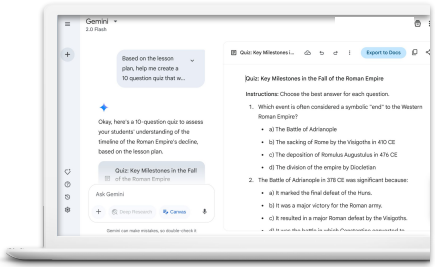
Six-month pilot program in Northern Ireland with educators and administrators from the Northern Ireland Education Authority's C2k program

Gemini

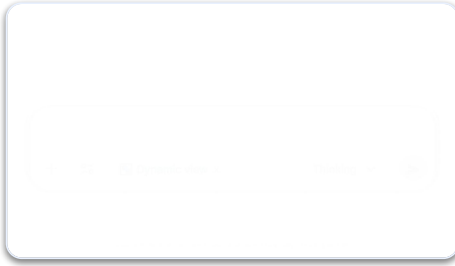
Visualize ideas with Nano Banana Pro 🍌



Save hours on your research with Deep Research



Assess student understanding with quizzes

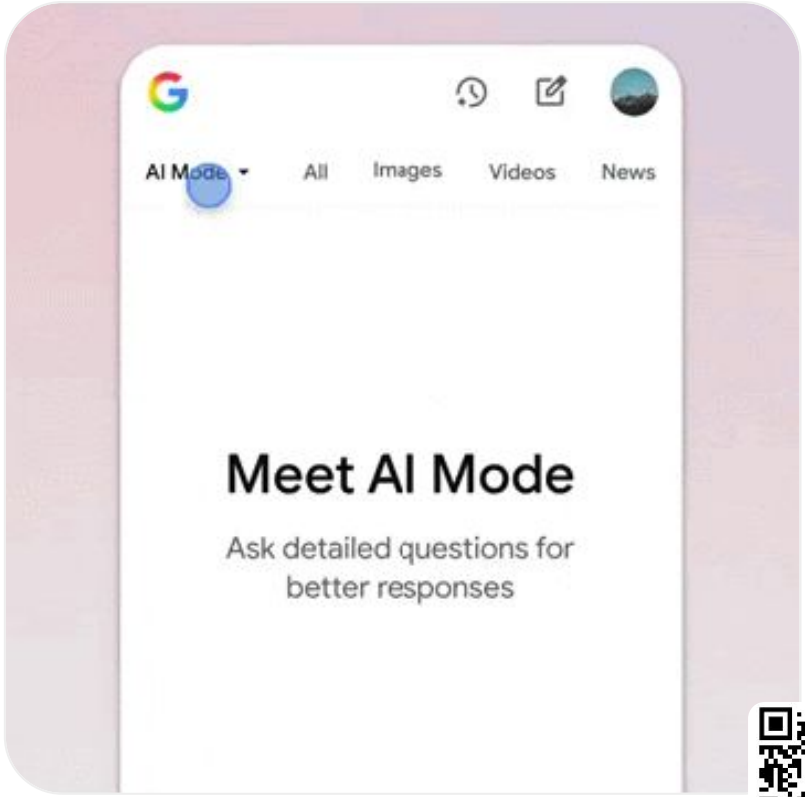


Create custom user interfaces to learn about any topic

A Helping Hand for Educators

Generative UI

Visual layouts, interactive tools & simulations in AI Mode



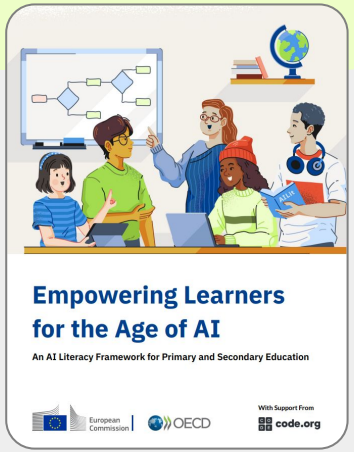
A Helping Hand for Educators

The Opportunity

AI Literacy

AI LIteracy

AI literacy represents the technical knowledge, durable skills, and future-ready attitudes required to thrive in a world influenced by AI. It enables learners to engage, create with, manage, and design AI, while critically evaluating its benefits, risks, and ethical implications.



AI LIteracy

WORLD ECONOMIC FORUM

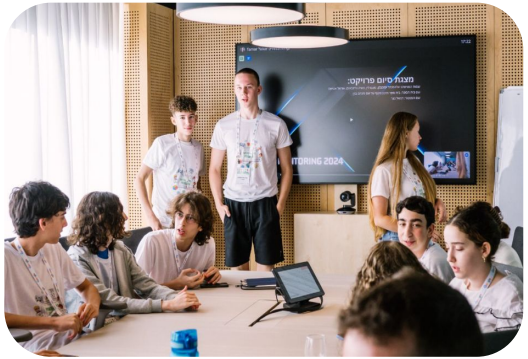
FORUM INSIGHT

What are the most valuable skills for the jobs of the future

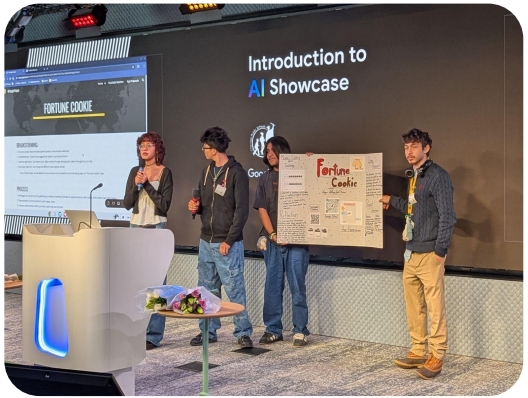
Employers surveyed said that 44% of the core skills needed for work will change in the next five years. Skills like 'AI and big data' and 'leadership and social influence' could be in higher demand.

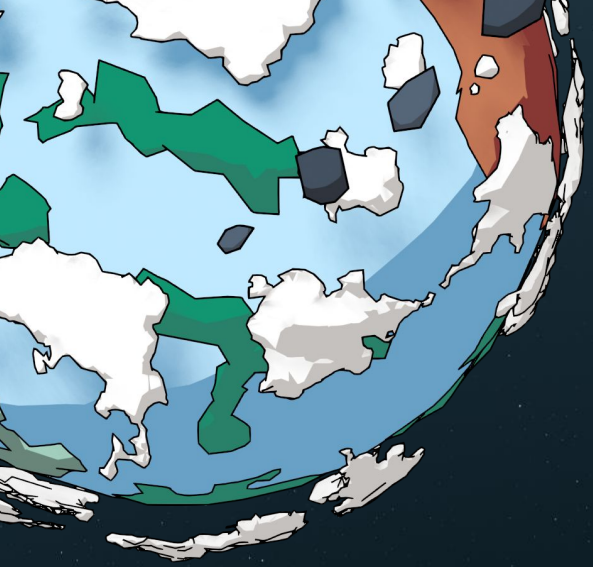
Google קרן רשי RASHI FOUNDATION המרכז לחינוך סייבר MOONA A SPACE FOR CHANGE

>hello tech_



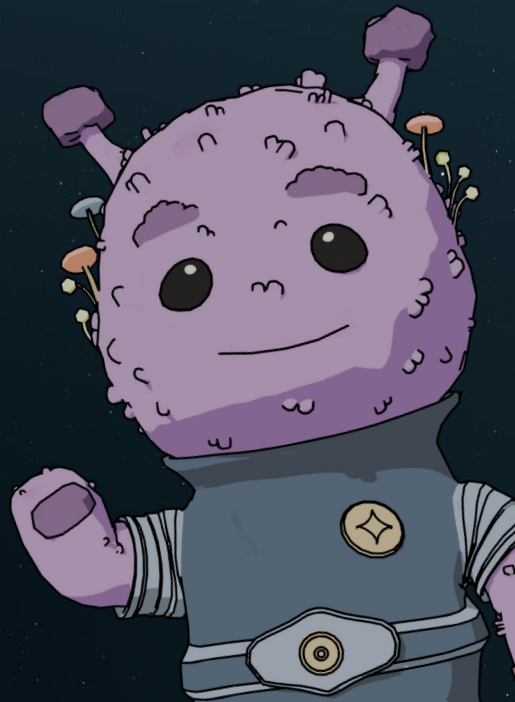
AI LIteracy





AI Quests

A new way for teens to understand AI



Google Research | Stanford Accelerator for LEARNING

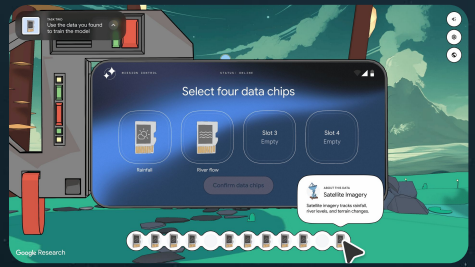
AI LIteracy

Overview: Flood Forecasting Quest

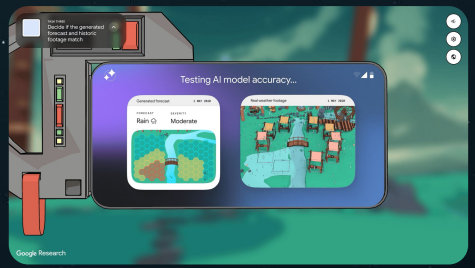
Understand the problem
Speaking to Luna, teachable agent

Task 1
Data collection

Task 2
Data cleaning

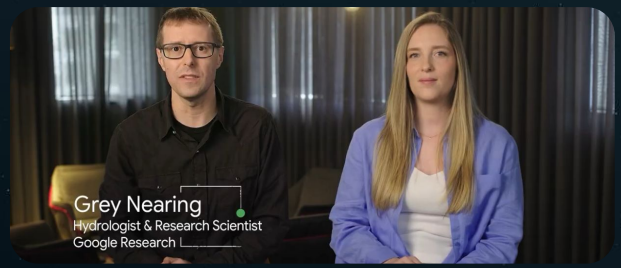


Task 3
Training the model



Task 4
Testing the Model

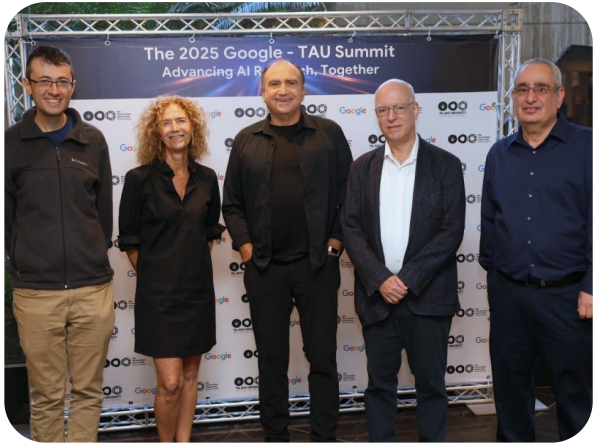
Task 5
Puting the output to use



Meet the Research team


>hello tech_


פרויקטים בחוברת
Google Research
אשר בהשראתם יצרנו
תכנים לתלמידים
AI for Crisis Response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AI as an amplifier of human ingenuity