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How Generative AI can Support Innovative Teaching Practices

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Outline

1. AI-assisted lesson materials and content generation.
2. Personalized learning pathways using AI.
3. AI-powered formative and summative assessments.
4. Case studies of AI integration in university courses.

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Introduction

What is Generative AI?

- AI that creates content, such as text, images, videos, and code. It creates content based on user's prompt or request.
- Examples: ChatGPT, Canva AI, Synthesia, and Gradescope.
- It helps educators create, personalize, and automate teaching materials.

Why is AI Important in Education?

- Enhances **teaching efficiency** by automating repetitive tasks.
- Supports **personalized learning** for students.
- Provides **real-time feedback** and instant resources.
- Encourages **interactive and engaging lessons**.

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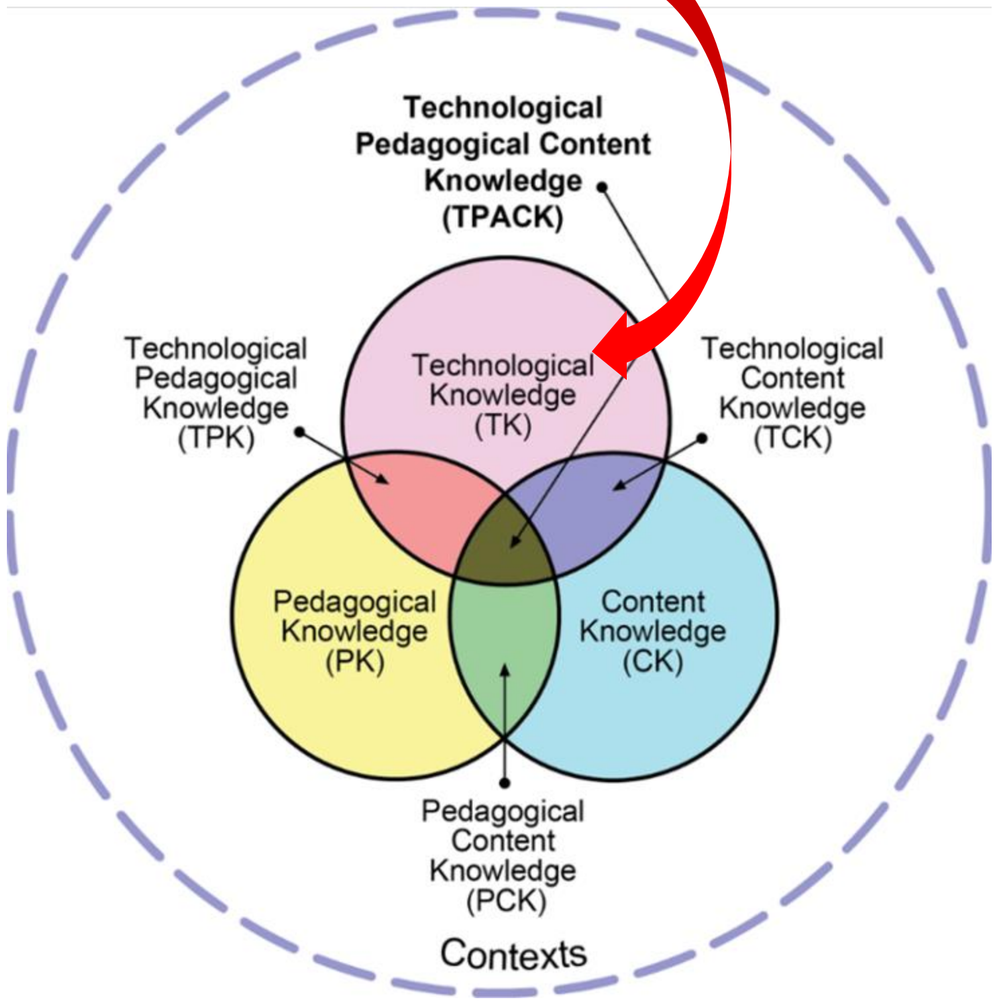
Consider how we integrate AI into teaching and learning

using pedagogy to reframe our perspective

AI is a tool



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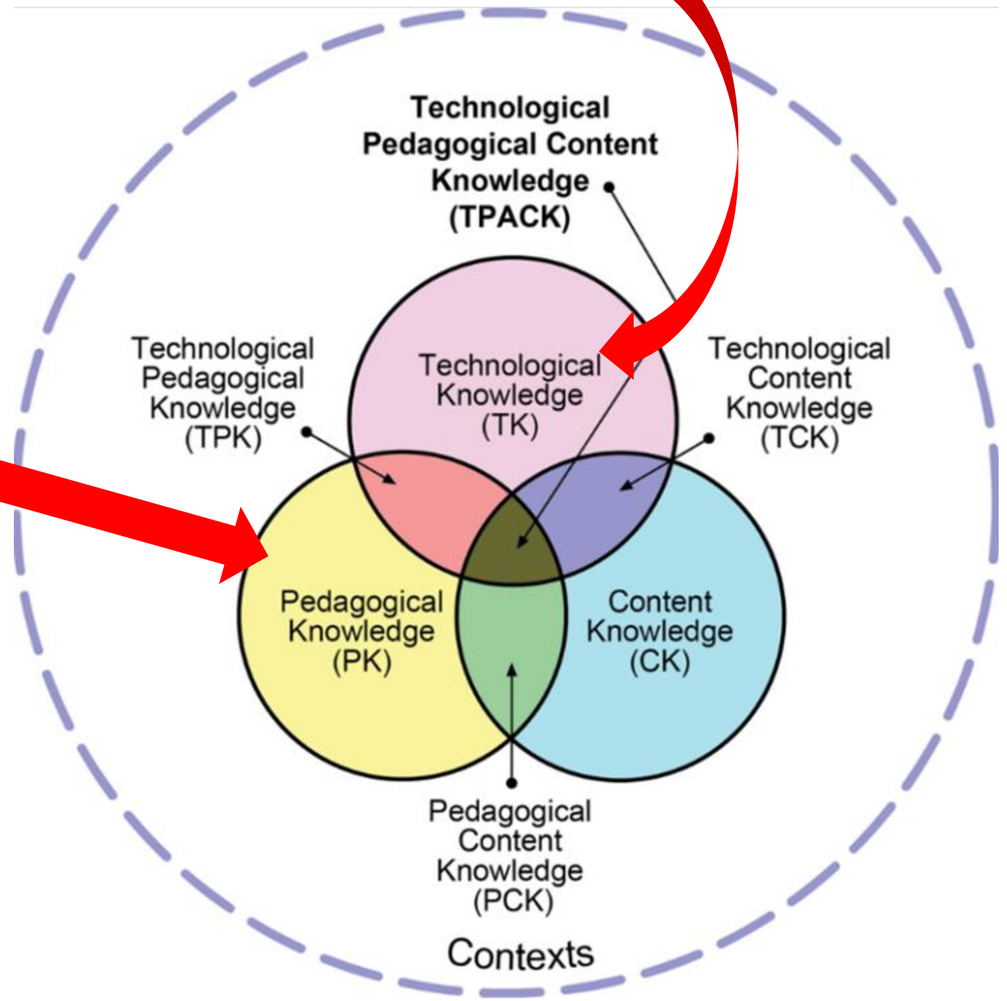
Improve creativity, critical thinking, engagement, leadership quality…etc.

The challenge: is to identify the appropriate pedagogy and innovate to enhance its effectiveness.

The pedagogy should facilitate co-learning and be personalized to cater to e.g, Generation Alpha's needs.

Many Alphas will already have started their own companies when they enrol into university (myforesight, 2019)

AI is a tool



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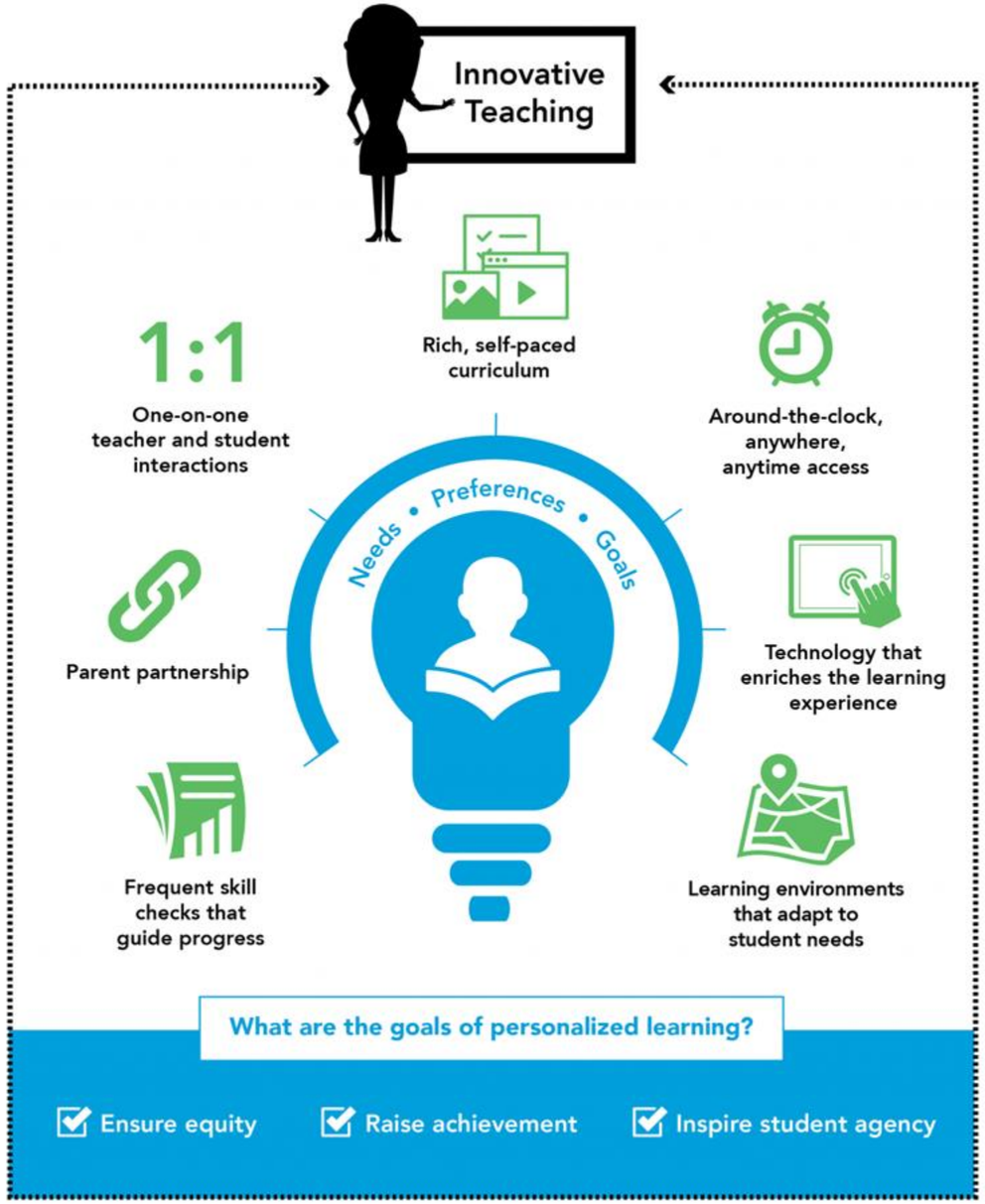
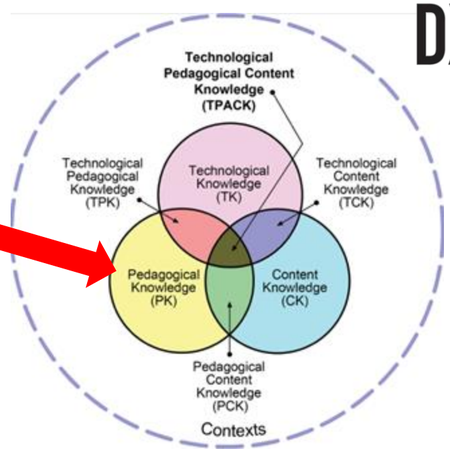
Teaching methods or pedagogy should be designed to promote co-learning and personalization





- **Project-Based Learning (PjBL)**
- **Flipped Classroom**
- **Peer Teaching and Mentoring**
- **Differentiated Instruction**
- **Student-Centered Learning**
- **Collaborative Learning Groups**
- **Personal Learning Plans (PLPs)**
- **Gamification** [Make learning content fun and engaging]
- **Competency-Based Education (CBE)**
- **Learning Analytics**
- **Multimodal Learning**
- **Community-Based Learning**
- **etc.**

Implementation of Cognitive and Social Apprenticeship Frameworks to Nurture Creativity in a Social Networking Site

Image source: 2023 e-Learning Infographics.

AI-assisted lesson materials and content generation

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AI for Content Creation

How AI helps educators create learning materials:

- Generates lecture notes & slides.
- Summarizes research papers & articles. AI tools for research purposes.
- Creates quizzes, exams & grading rubrics.
- Designs visual content (diagrams, infographics, presentations).

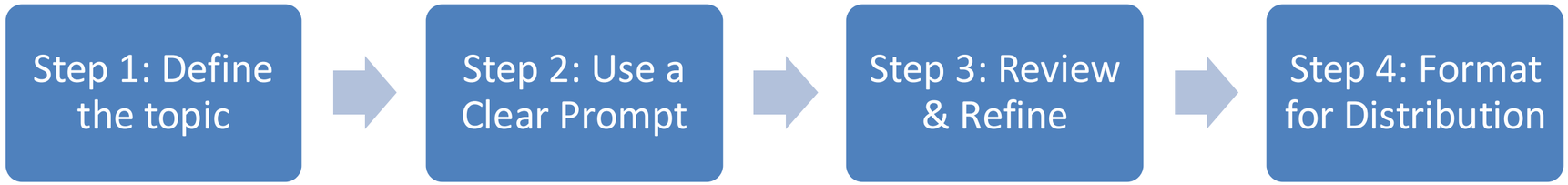
Example: ChatGPT for text, Canva AI for images, Quizlet for quizzes.

Generating lecture notes using ChatGPT

Generating lecture notes using ChatGPT

In ChatGPT, a **prompt** is the text input you provide to instruct the model and shape its response. It acts as the starting point, helping the AI understand your request and generate relevant content. A w**ell-structured, clear, and specific prompt** ensures that the AI delivers accurate and meaningful answers tailored to your needs.

Generating lecture notes using ChatGPT



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Some Tips

Be Clear and Specific: Clearly state the topic, context, or task you want the AI to address

Use Direct Instructions: Provide clear instructions on what you want the AI to do. Use direct imperative sentences, like "Describe," "Explain," "List," "Compare," etc.

Break Down Complex Tasks: If your request involves multiple steps, break them down into separate prompts. This prevents confusion and ensures more accurate responses.

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Effective Prompts

Example of prompt:

Act as a university professor. Generate lecture notes for a 1-hour class on "Introduction to Artificial Intelligence."

Include:

- A brief introduction
- Key concepts
- Real-world applications
- Challenges and ethical issues
- Summary and discussion questions

Output

1. Introduction (10 Minutes)

What is Artificial Intelligence (AI)?

- AI refers to the ability of machines to perform tasks that typically require human intelligence.
- It involves **learning, reasoning, problem-solving, perception, and language understanding**.
- AI is used in various fields such as healthcare, finance, transportation, and education.

Brief History of AI:

- 1950s: **Alan Turing** proposed the idea of machine intelligence.
- 1956: **Dartmouth Conference** marked the birth of AI as a field.
- 1980s-1990s: AI saw improvements in **machine learning (ML) and neural networks**.
- 2000s-Present: Advancements in **deep learning, big data, and automation**.

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2. Key Concepts in AI (15 Minutes)

Types of AI:

1. **Narrow AI (Weak AI):**
   - Designed for specific tasks (e.g., voice assistants like Siri, Google Assistant).
2. **General AI (Strong AI):**
   - AI with human-like intelligence and decision-making (not yet achieved).
3. **Super AI:**
   - Hypothetical AI that surpasses human intelligence.

AI Technologies:

- **Machine Learning (ML):** AI learns from data without being explicitly programmed.

3. Real-World Applications of AI (15 Minutes)

How AI is Used in Different Fields:

📌 **Healthcare:**

- AI diagnoses diseases (e.g., AI-assisted radiology, IBM Watson).
- Drug discovery and personalized medicine.

📌 **Finance:**

- AI-powered fraud detection.
- Algorithmic trading in stock markets.

📌 **Education:**

- AI tutors (e.g., Khan Academy AI).
- Personalized learning experiences.

📌 **Transportation:**

- Self-driving cars (e.g., Tesla Autopilot).
- AI-powered traffic management.

📌 **Retail & E-commerce:**

- AI chatbots for customer support.
- Personalized recommendations (e.g., Amazon, Netflix).

Effective Prompts

Simple prompt: "Create a lesson plan on topic bouyancy for secondary students with learning objectives, activities, and assessment methods.”

Detailed prompt: "Design a comprehensive lesson plan on the topic of buoyancy for secondary students. The plan should include clear learning objectives, engaging student-centered activities, and suitable assessment methods to evaluate understanding. Incorporate hands-on experiments or real-world applications to enhance learning."

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Effective Prompts

Simple Prompt:
"Write an essay about climate change."

Detailed Prompt:
*"Write a **1,000-word persuasive essay** on climate change, focusing on its **causes, effects, and possible solutions**. Structure the essay with an **introduction, three body paragraphs**, and a **conclusion**. Use **real-world examples**, include at least **two scientific studies**, and maintain a **formal academic tone**."*

Effective Prompts

Simple Prompt:
"Write a Python script for sorting a list."

Detailed Prompt:
*"Write a **Python script** that sorts a **list of integers** using the **Merge Sort algorithm**. The script should be **well-commented**and include a function that accepts **user input**, sorts the list, and then prints both the **unsorted and sorted lists**. Ensure the code is **optimized for efficiency** and follows **best coding practices**."*

Creating an image

Detailed Prompt:

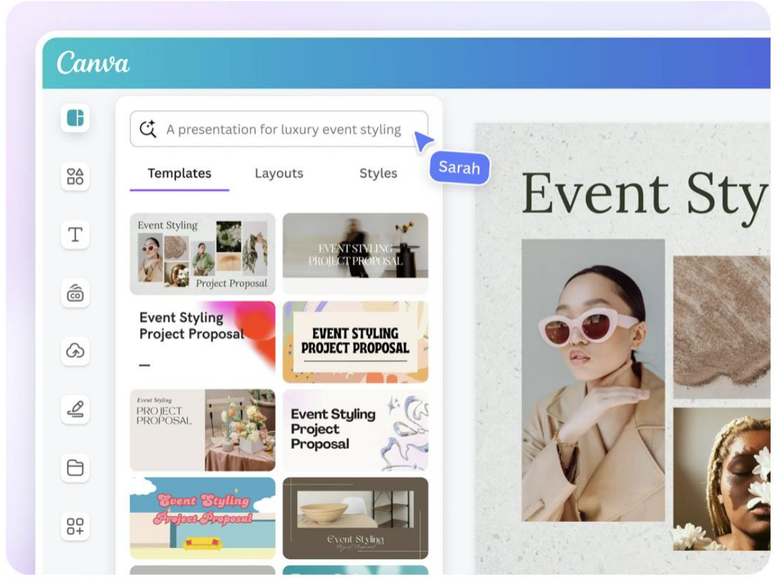
"Create a digital illustration of a female lecturer sitting in a well-lit academic office, with a modern computer in front of her. She is engaged in research, surrounded by books, papers, and a whiteboard with diagrams related to online learning and mobile learning. The computer screen displays graphs, charts, and e-learning content. The room has a professional yet cozy ambiance, featuring a bookshelf, a coffee mug, and a window with natural light filtering in. The scene should feel intellectual, warm, and inspiring, emphasizing her passion for digital education."

Creating presentation slides

Some **free AI tools** that can help you create **presentation slides** quickly and efficiently:

- Canva (Magic Design)
- Gamma AI
- Tome AI
- Slidesgo (AI Presentation Maker)
- Microsoft Copilot (PowerPoint AI)

Canva Magic Design



Fast-track presentations with AI

Fast-track your next pitch with Magic Design™ for Presentations. Simply type your idea and watch it generate professional-looking pages filled with your topic, outline, and sample content. Your first draft is fully designed with captivating content in seconds.

Try Magic Design

https://www.canva.com/magic-design/

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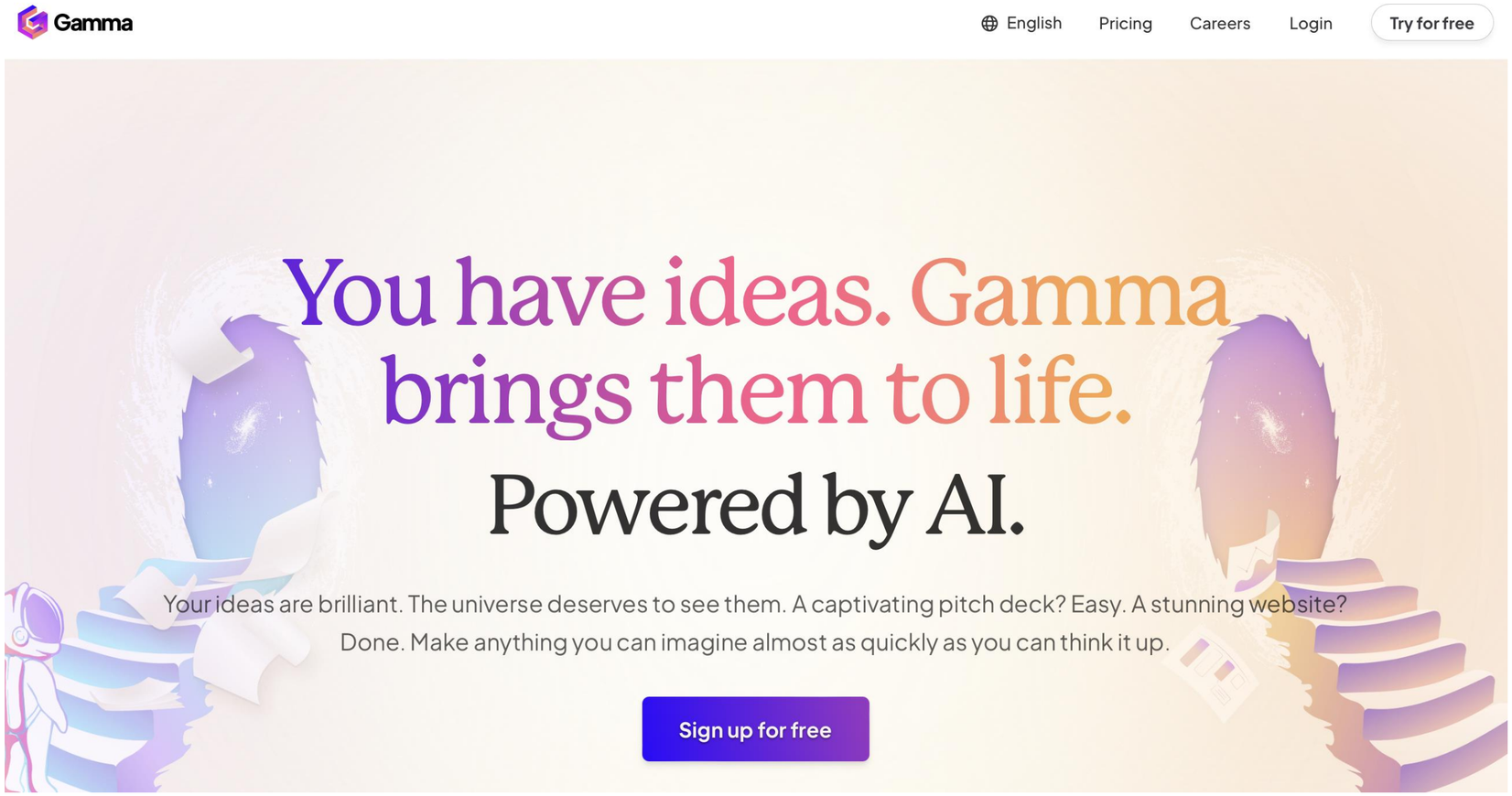
Gamma AI



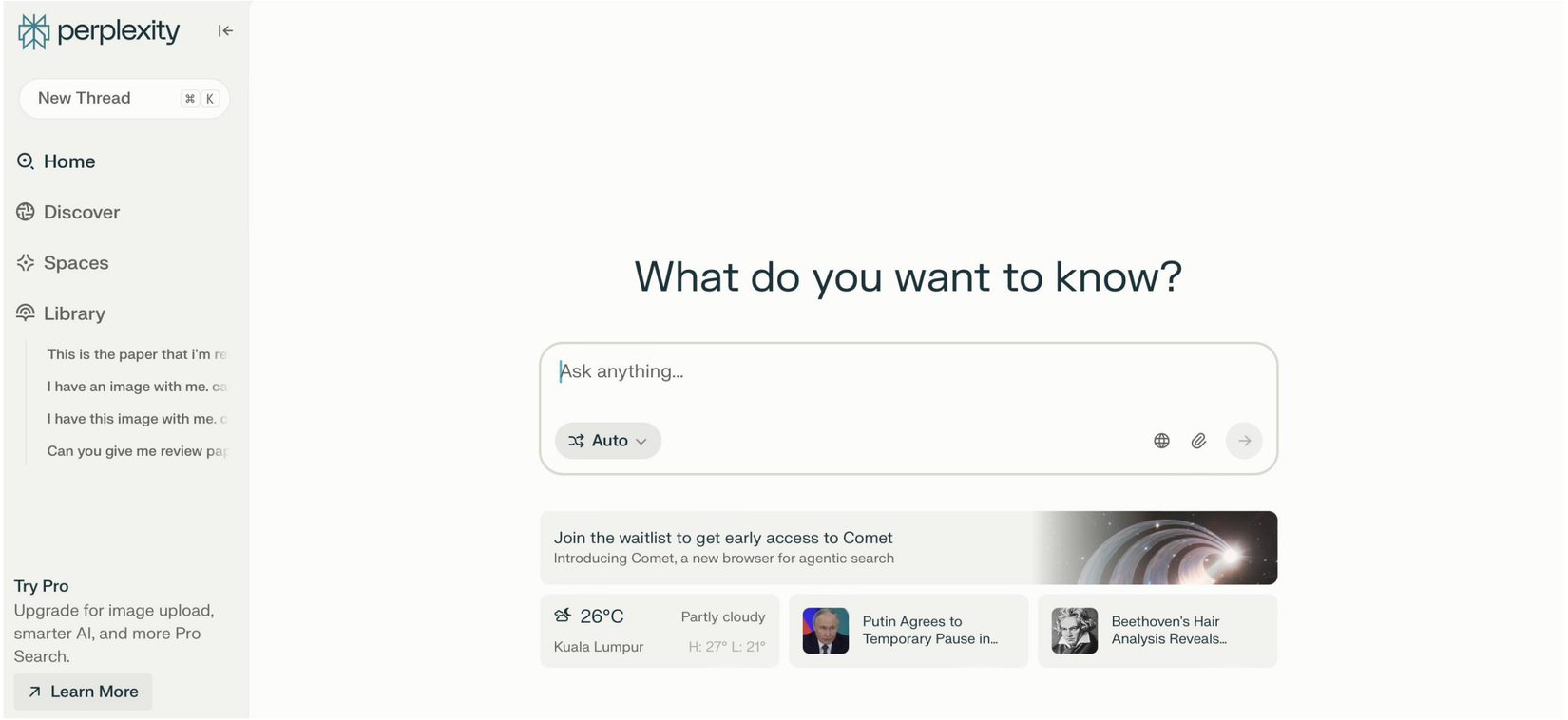
https://gamma.app

AI tools for research purposes

Some of AI tools for research purposes:

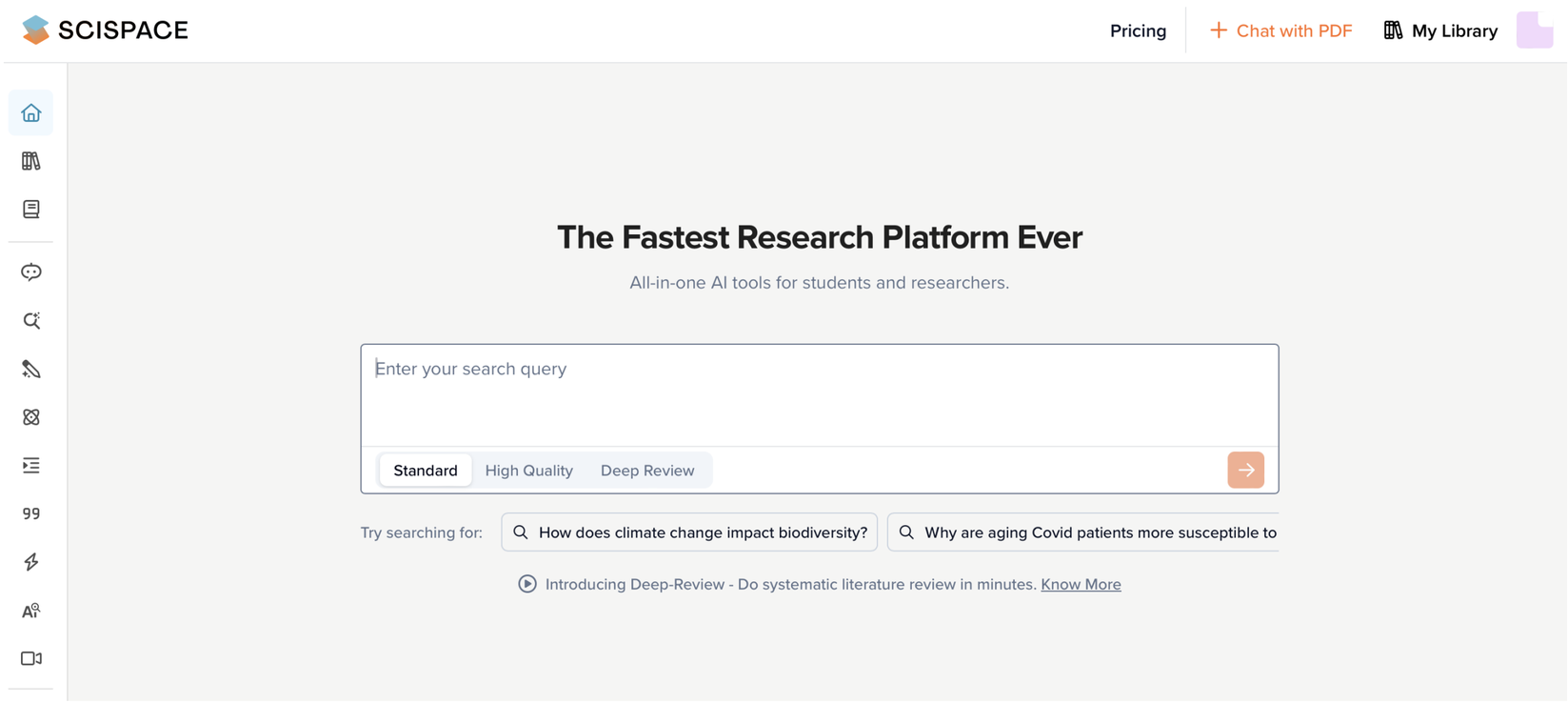
- Google Gemini
- Perplexity
- Scispace
- Elicit
- Quillbot

AI tools for research purposes



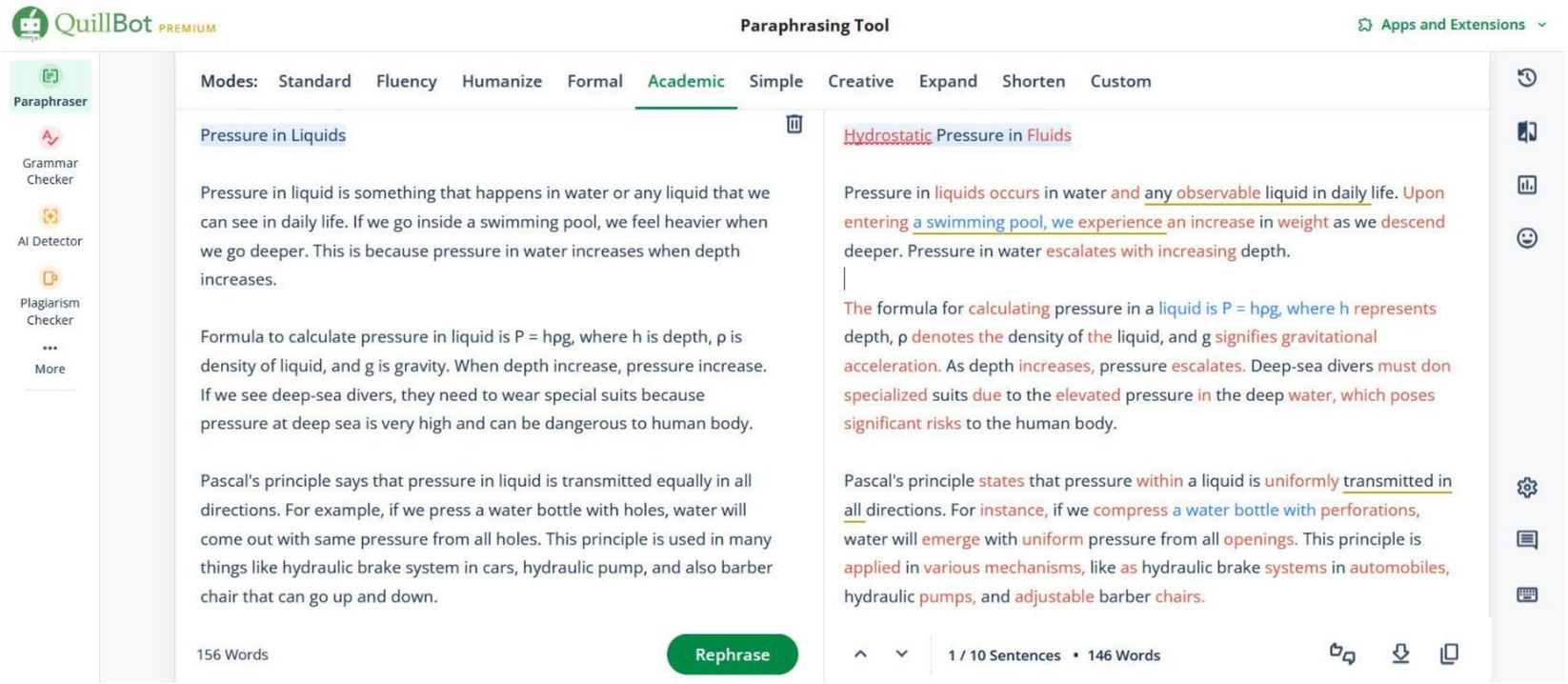
https://www.perplexity.ai

AI tools for research purposes



https://scispace.com

AI tools for research purposes



https://quillbot.com

Design visual content (diagrams, infographics, presentations)

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Some AI tools to design visual content (diagrams, infographics, presentations).

- Lucidchart
- Microsoft Visio
- Miro
- Visme
- Piktochart

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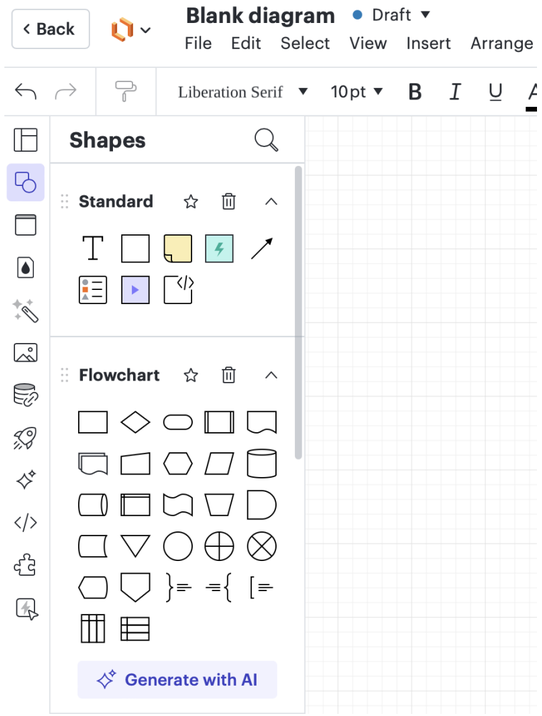
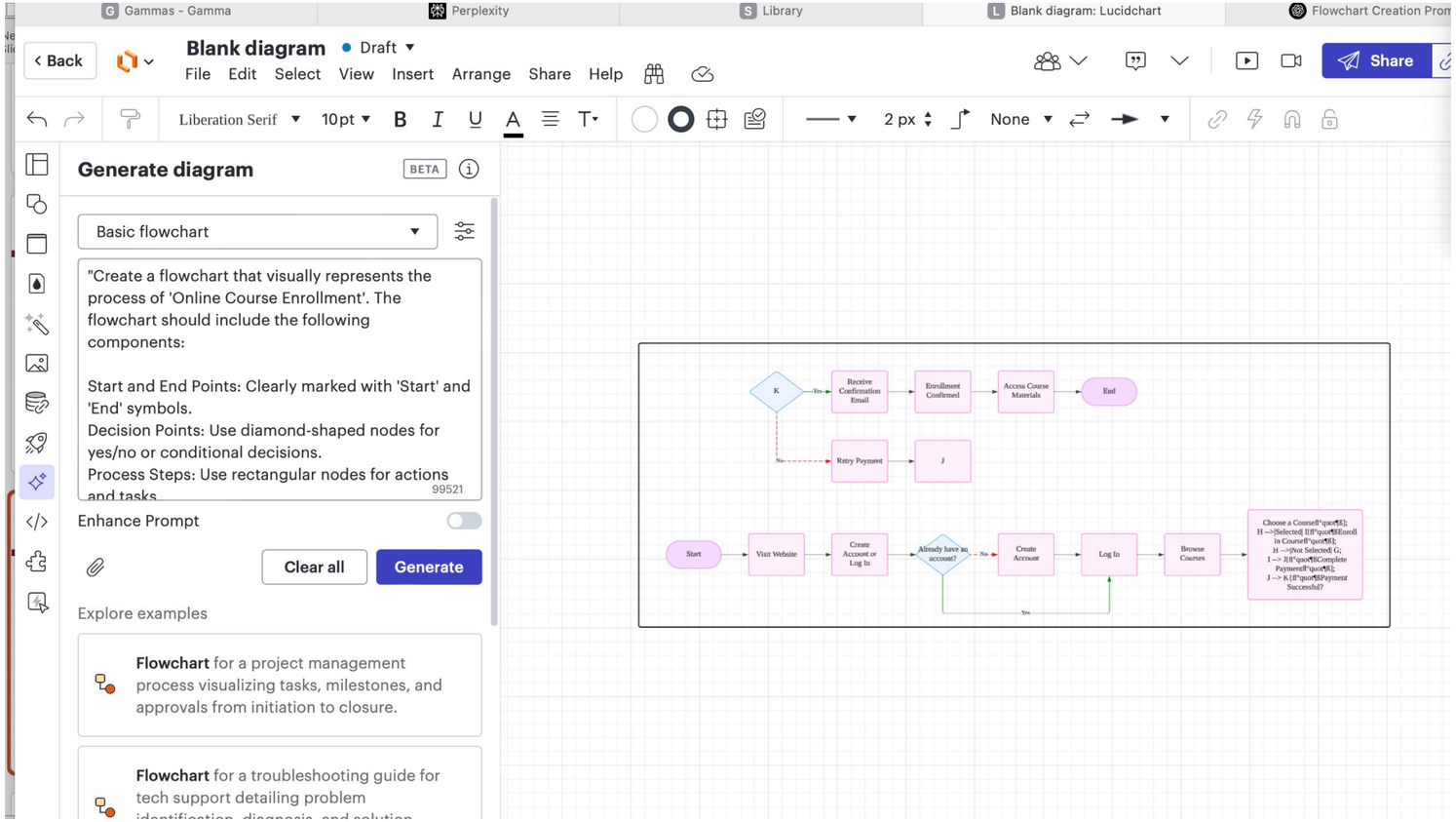
Lucidchart



https://lucid.app/

Lucidchart



"Create a flowchart that visually represents the process of 'Online Course Enrollment'. The flowchart should include the following components:

Start and End Points: Clearly marked with 'Start' and 'End' symbols.

Decision Points: Use diamond-shaped nodes for yes/no or conditional decisions.

Process Steps: Use rectangular nodes for actions and tasks.

Connectors: Use arrows to indicate the flow direction.

Swimlanes (if needed): Organize the flow by department, role, or system.”

Personalized learning pathways using AI.

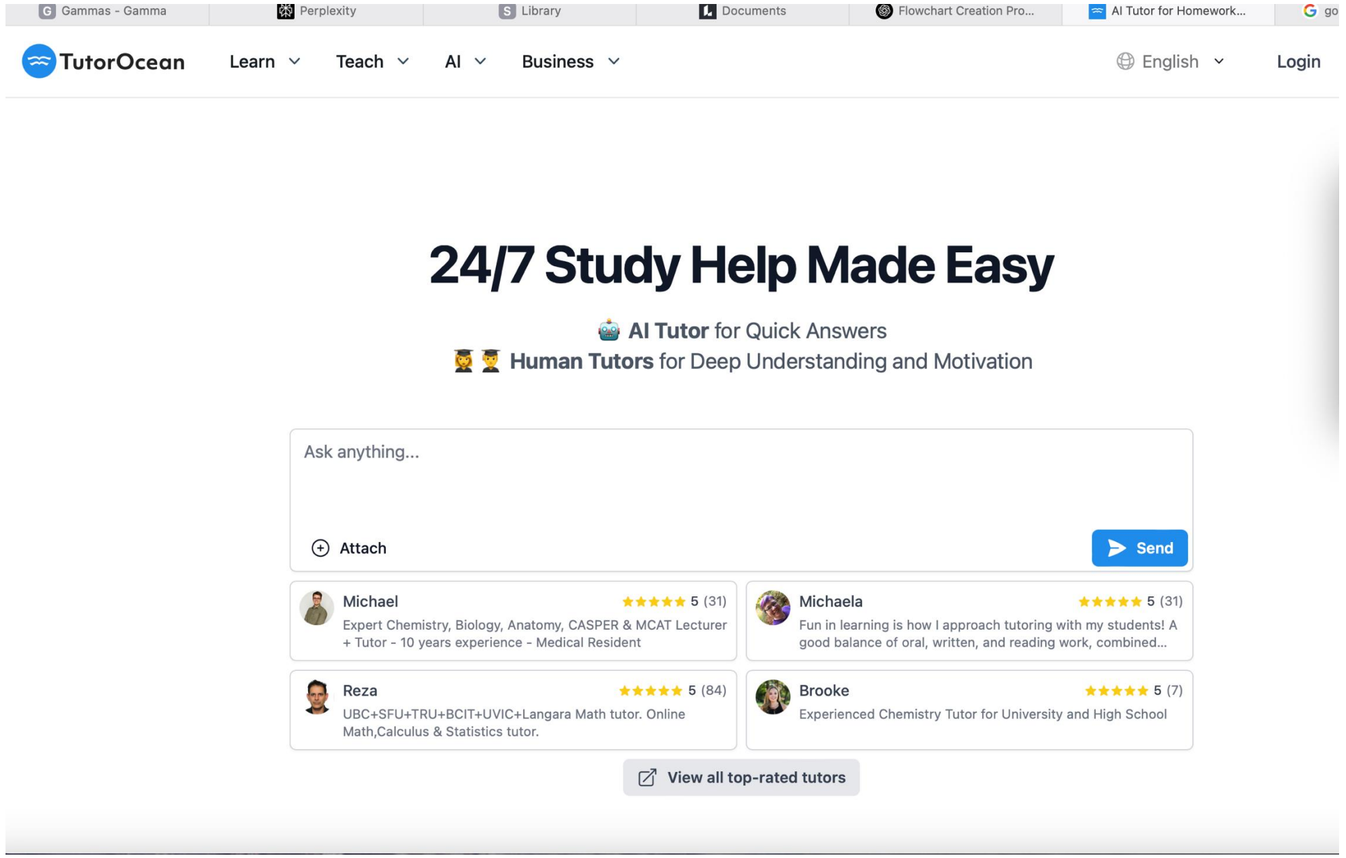
How AI adapts to different learning styles:

- **Adaptive learning - AI** adjusts difficulty levels based on student progress.

  Adaptive learning uses AI algorithms to **adjust the difficulty and pacing** of educational content based on a student's performance. Instead of a one-size-fits-all approach, AI **customizes lessons**, ensuring students receive challenges suited to their skill level.
- **AI Tutors:** Tools like Khanmigo and Socratic provide real-time explanations.
- **Voice Assistants:** Assist visually impaired or differently-abled students.

Example: Khan Academy AI Tutor, Google Socratic, Tutor Ocean.

Tutor Ocean



https://www.tutorocean.com

AI-powered formative and summative assessments

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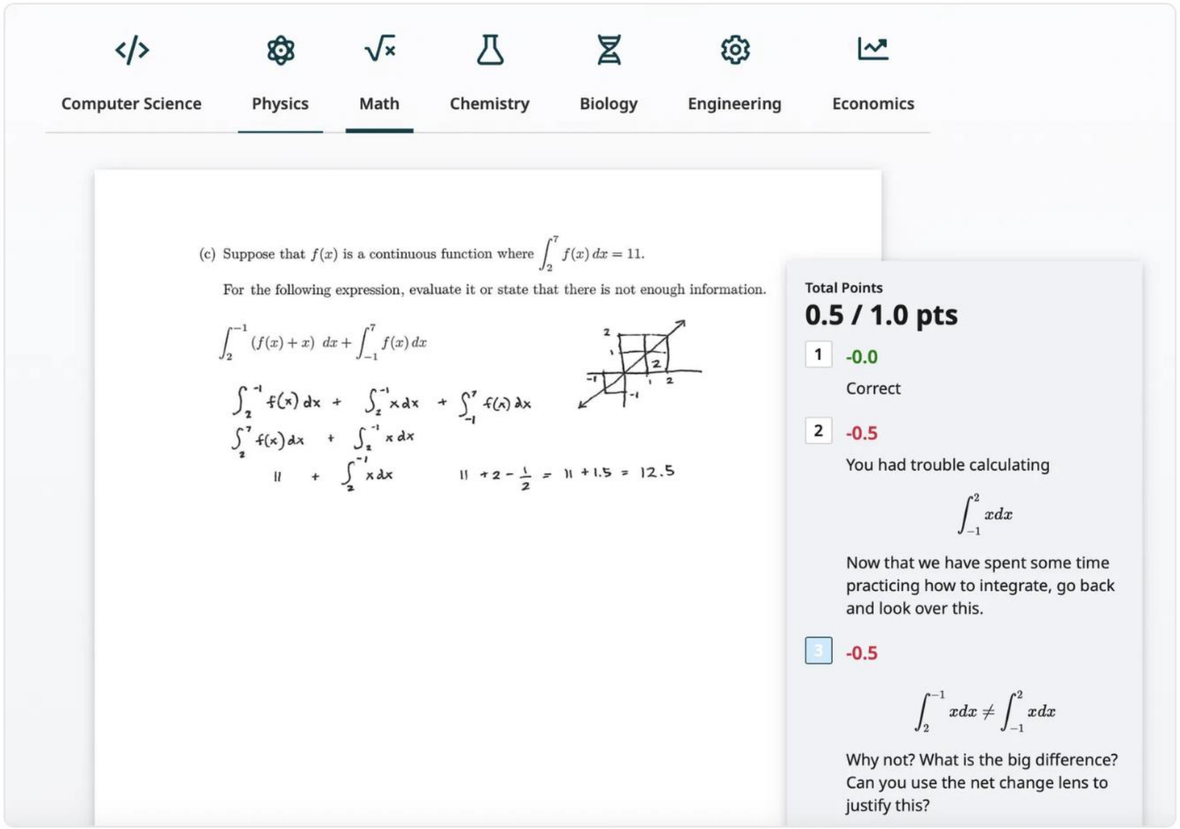
How AI simplifies grading & feedback:

- **Automated Grading:** AI checks assignments (Gradescope, Turnitin AI).
- **Instant Feedback:** AI suggests improvements in writing (Grammarly, Quillbot).
- **Student Progress Tracking:** AI provides learning insights.

Example: Turnitin AI for plagiarism detection, Gradescope for grading.

Gradescope


Computer Science
Physics
Math
Chemistry
Biology
Engineering
Economics
(c) Suppose that $f(x)$ is a continuous function where $\int_2^7 f(x)\,dx = 11$.
For the following expression, evaluate it or state that there is not enough information.
$\int_2^{-1} (f(x)+x)\,dx + \int_{-1}^{7} f(x)\,dx$
$\int_2^{-1} f(x)\,dx + \int_2^{-1} x\,dx + \int_{-1}^{7} f(x)\,dx$
$\int_2^{7} f(x)\,dx + \int_2^{-1} x\,dx$
$11 + \int_2^{-1} x\,dx$
$11 + 2 - \frac{1}{2} = 11 + 1.5 = 12.5$
Total Points
0.5 / 1.0 pts
1 -0.0
Correct
2 -0.5
You had trouble calculating
$\int_{-1}^{2} x dx$
Now that we have spent some time practicing how to integrate, go back and look over this.
3 -0.5
$\int_2^{-1} x dx \neq \int_{-1}^{2} x dx$
Why not? What is the big difference? Can you use the net change lens to justify this?

Case studies of AI integration in university courses

"How do you think AI is already shaping university education?”

Case Study 1: AI-Powered Content Creation

Example: Harvard University – AI for Course Material

- **How it's used:** Harvard uses **ChatGPT** to help professors generate **lecture notes, quizzes, and course summaries**.

Impact:

- Saves time in content preparation.
- Allows educators to focus on interactive discussions.
- Customizes learning materials based on student needs.

Case Study 2: AI for Personalized Learning

Example: Georgia Tech – AI Teaching Assistant

- **How it's used:**
  - Georgia Tech developed "Jill Watson," an AI teaching assistant for an online computer science course.
  - AI answers **common student questions**, reducing instructor workload.

Impact:

- Faster responses to students.
- More engagement in online discussions.
- Students reported improved satisfaction with instant AI support.

Case Study 3: AI in Assessments & Feedback

Example: University of Edinburgh – AI Grading & Feedback

- **How it's used:**
  - Uses **Gradescope AI** to **automate grading** of assignments and exams.
  - AI detects patterns in students' mistakes and provides **instant feedback**.

Impact:

- Reduces grading workload for large classes.
- Gives students **real-time suggestions for improvement**.
- Improves grading consistency.

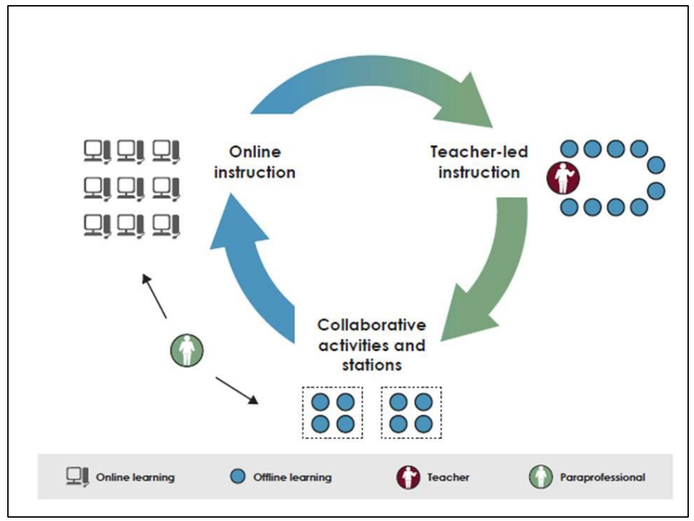
Ethical Considerations & Challenges

- **Over-reliance on AI:** Students must still develop **critical thinking** skills.
- **Bias in AI:** AI-generated feedback can sometimes be **inaccurate** or **biased**.
- **Data Privacy:** Universities must **protect student data** when using AI tools.

Solution: AI should **support**, not replace, human instructors.

Conclusion & Takeaways

- AI is enhancing university education, not replacing teachers.
- Case studies show AI improves efficiency, engagement, and feedback.
- Educators should explore AI responsibly for better learning experiences.



Station rotation model

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