

# Generative AI and Education The New Hybrid

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CONTACT NORTH: 30 OCTOBER 2024

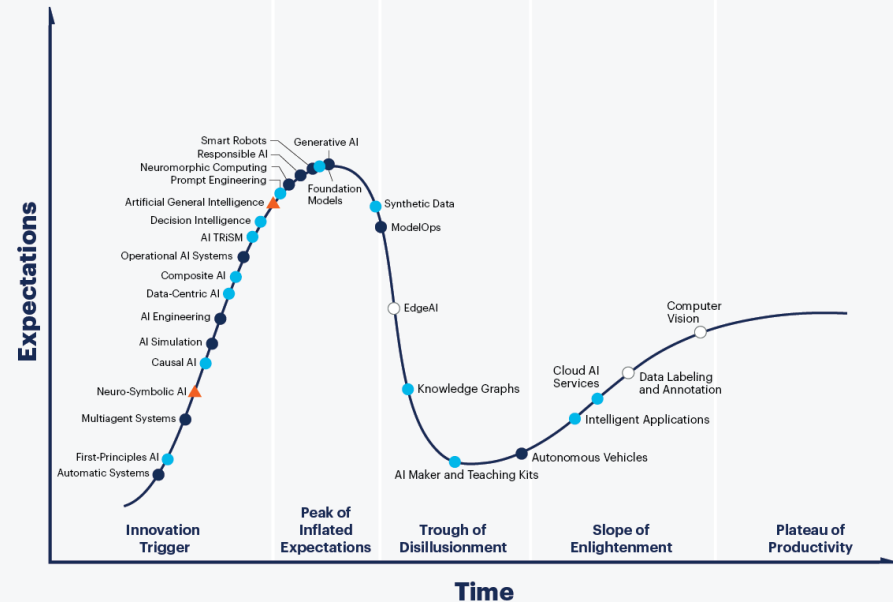
# Resources

- ▶ YouTube (repository of public talks): <https://www.youtube.com/@maireadpratschke/playlists>
- ▶ LinkedIn (random sharing – my views): <https://www.linkedin.com/in/maireadpratschke/>
- ▶ AI-ALOE (Research Fellow & Advisory Board member): <https://aialoe.org/>
- ▶ Personal website: <https://maireadpratschke.com/>
- ▶ Book, *Generative AI and Education: digital pedagogies, teaching innovation and learning design*  
<https://link.springer.com/book/10.1007/978-3-031-67991-9>



# AI in industry v academia

## Hype Cycle for Artificial Intelligence, 2023

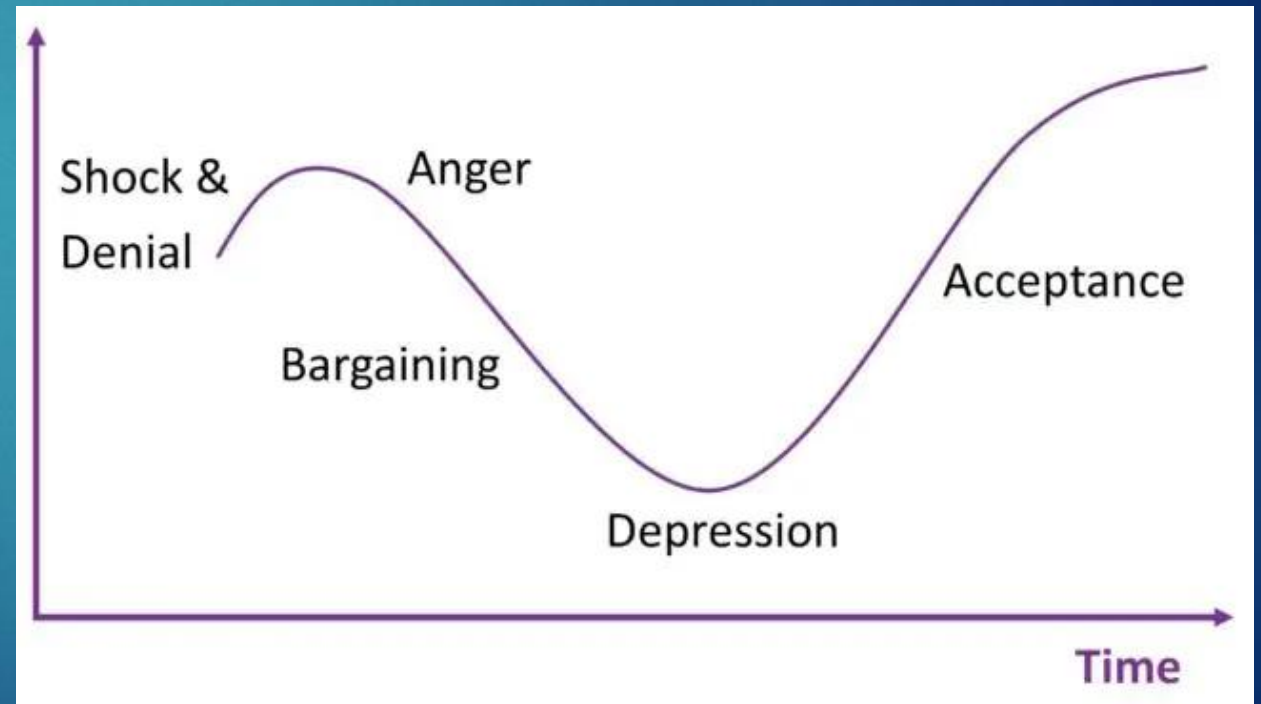


Plateau will be reached:  
 ○ less than 2 years   ● 2 to 5 years   ● 5 to 10 years   ▲ more than 10 years   ⊗ obsolete before plateau   As of July 2023

gartner.com

Source: Gartner  
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Gartner.



# Who controls AI in education?

“Who should control AI in education: educators, students, computer scientists, or large corporations? These are indeed existential questions if AI does become immensely successful in reducing the costs of teaching and learning: but at what cost to us as humans?”

~~Fortunately, AI is not yet in a position to provide such a threat, but this will not always be the case.~~

The tsunami is coming here.” [my edit]

- Tony Bates, 2020

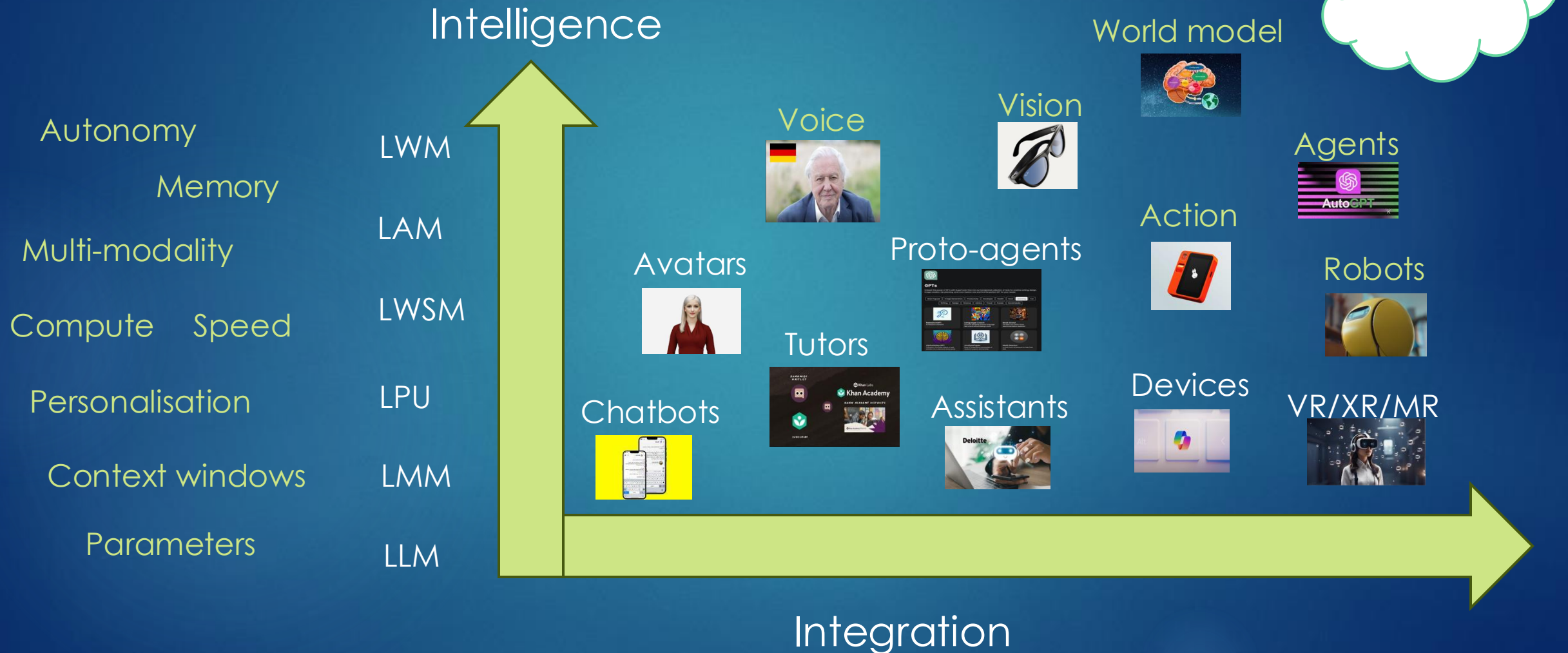
# Intelligent machines

LEARNING + LANGUAGE

# Dartmouth, 1956

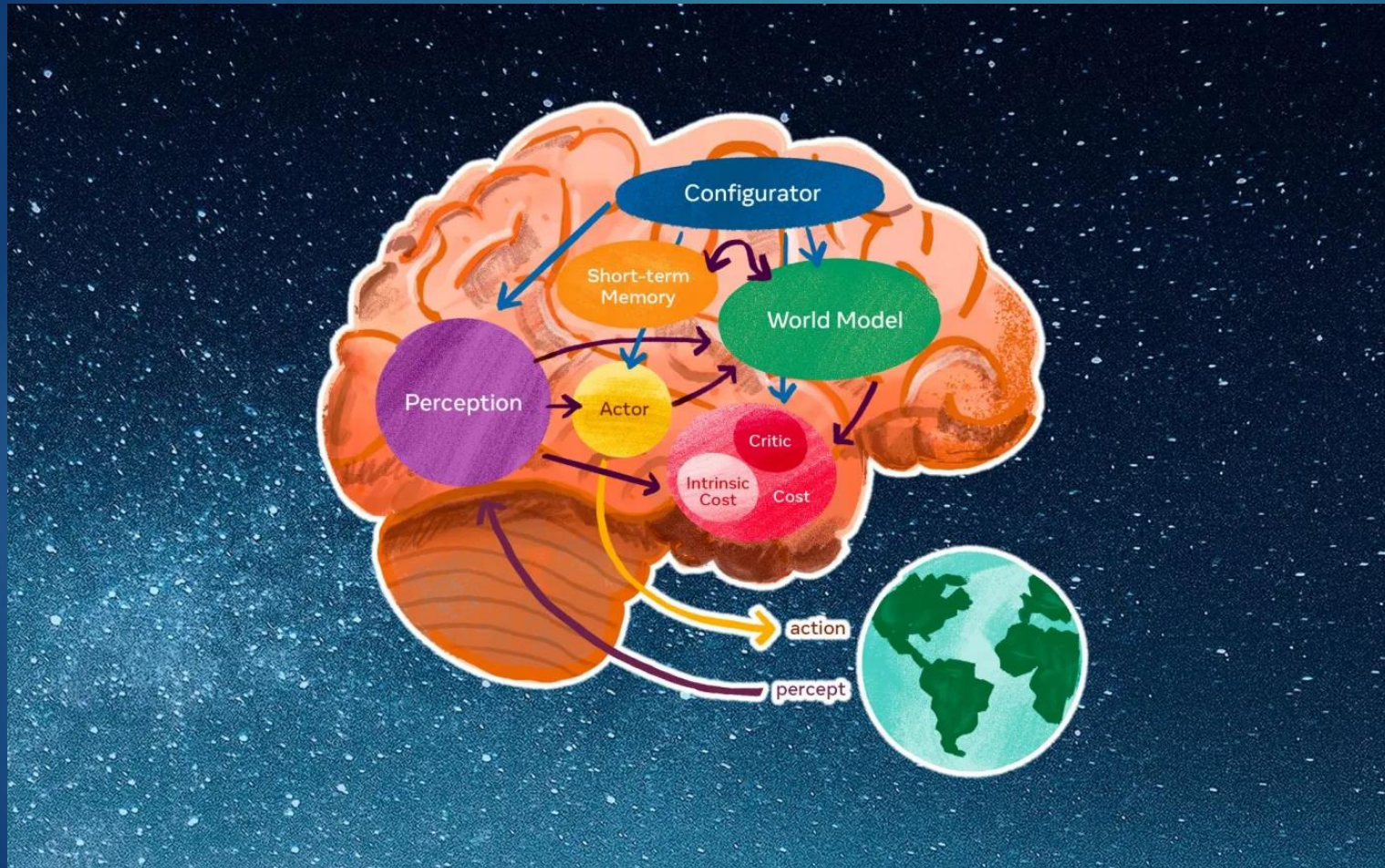


# The direction of travel



AGI

# World Models



## Fei-Fei Li's World Labs AI Out Of Stealth With \$230 Million, New Snap Specs, Neuralink Targets Blindness

Charlie Fink Contributor

A former tech executive covering AI, XR and The Metaverse for Forbes.

Follow



Sep 19, 2024, 07:26pm EDT

Updated Sep 23, 2024, 03:47pm EDT



SAN FRANCISCO, CALIFORNIA - DECEMBER 05: Fei-Fei Li speaks onstage during The AI Optimist Club at ... [+] GETTY IMAGES FOR WIRED

Fei-Fei Li's World Labs comes out of stealth with \$230M in



# Strawberry (GPT-o1): AI “reasoning”



Thought for 65 seconds ^

## Calculating surface area and volume

I'm thinking through the dimensions of a rectangular box with a surface area of 54 and volume of 23. Using formulas for surface area and volume, I found relationships between  $x$ ,  $y$ , and  $z$ .

## Calculating the smallest sphere

The smallest sphere containing the box has a radius that is half the space diagonal of the box. This radius is derived from the dimensions of the box and its calculated space diagonal length.

## Connecting volume and surface area

I'm starting to link the volume and surface area constraints to find the smallest sphere's radius. This involves examining the given equations and their implications.

## Weighing options

I'm gathering info on finding the smallest radius  $r$  to contain all boxes in set  $B$ . I'm also exploring if  $r^2$  is the maximum of  $\frac{1}{4}(x^2 + y^2 + z^2)$  for  $x, y, z$  meeting given constraints.

## Determining the radius

I'm piecing together that the radius  $r$  of the smallest sphere containing all rectangular boxes in  $B$  is calculated by the formula  $r = \sqrt{\frac{x^2 + y^2 + z^2}{4}}$ , using the maximal space diagonal among the boxes.

## Breaking down the equation

OK, let me see. I'm noting the need to find the maximum value of  $x^2 + y^2 + z^2$  using constraints, leading to the expression  $(1/4)((x + y + z)^2 - 54)$ .

## Evaluating constraints

Maximizing  $(x + y + z)^2$  with  $xyz = 23$  and  $xy + yz + xz = 27$ . Considering symmetric sums and applying the arithmetic-geometric mean inequality.

## Approach:

- We express  $x^2 + y^2 + z^2$  in terms of the sum and product of  $x, y, z$  using the identity:  $x^2 + y^2 + z^2 = (x + y + z)^2 - 2(xy + yz + xz)$
- We know  $xy + yz + xz = 27$  (from the surface area equation).
- We aim to maximize  $x + y + z$  since  $(x + y + z)^2$  directly affects  $x^2 + y^2 + z^2$ .

## Simplifying with Symmetry:

- Assume  $x = y$  for symmetry (this assumption is valid as it leads to the maximum value in this context).
- Substitute  $x = y$  into the equations and solve for  $x$  and  $z$ .
- We find two possible solutions for  $x$ :  $x = 2$  and  $x = -1 + 2\sqrt{6}$ . Only positive real solutions are valid, so we consider  $x = 2$  and  $x = -1 + 2\sqrt{6}$ .

## Calculations:

- For  $x = 2$ :
  - $z = \frac{23}{x^2} = \frac{23}{4} = 5.75$
  - $x^2 + y^2 + z^2 = 4 + 4 + 33.0625 = 41.0625$
  - $r^2 = \frac{41.0625}{4} = 10.265625$
- For  $x = -1 + 2\sqrt{6}$ :
  - Calculations yield a smaller value of  $r^2$ , so we focus on the first case.

## Final Computation:

- Express  $r^2$  as a fraction:  $r^2 = 10.265625 = \frac{657}{64}$
- Find  $p + q$  where  $\frac{p}{q} = \frac{657}{64}$ :  $p + q = 657 + 64 = 721$

## Answer:

721



# The verdict

- ▶ “The experience seemed roughly on par with trying to advise a *mediocre, but not completely incompetent*, graduate student.
  - ▶ This was an improvement over previous models, whose capability was closer to an *actually incompetent* graduate student.
  - ▶ It may only take one or two further iterations of improved capability until I see the level of ‘*competent graduate student*’ is reached...
  - ▶ At which point I could see this tool being of *significant use in research level tasks.*”
- Terence Tao, Professor of Mathematics, UCLA

# The Nobel Prize in... AI

## Physics AI



- ▶ Geoffrey Hinton, Godfather of AI, for training artificial neural networks using physics
- ▶ Co-authored the paper on the backpropagation algorithm (1986)
- ▶ Used for training multi-layer neural networks

## Chemistry AI



- ▶ Demis Hassabis, Google DeepMind, for computational protein design
- ▶ Designed the AI model AlphaFold that predicts proteins' structures
- ▶ 1,8 million researchers using AlphaFold



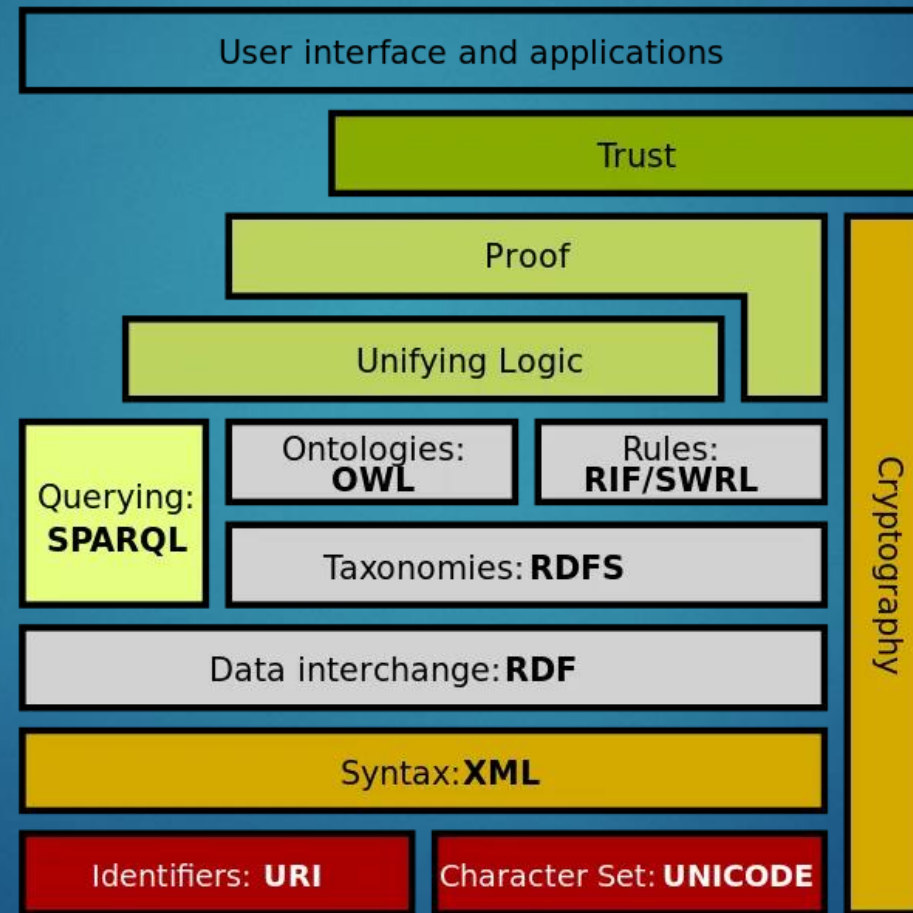
# From social to symbiotic

TECHNOLOGY AND LEARNING INNOVATION





# Web 3.0 The Semantic Web



# Digital identities

The image shows a screenshot of a Credly badge page for 'Javascript' issued by Lincoln Technologies. The page includes a search bar at the top, a user profile icon, and a 'Discover badges, skills or organizations' search field. The badge itself is a circular emblem with the Lincoln Technologies logo and the word 'JAVASCRIPT'. The page text indicates the badge was issued to Alan Lee on July 31, 2023, and expires on August 1, 2025. A 'Celebrate' button is visible next to a 'Verify' button. The badge issuer profile is identified as Lincoln Technologies. The badge description states that holders are competent in the foundations of JavaScript, algorithms, and data structures. The page also features a 'Learn more' link, a 'Template attributes' section with buttons for 'Validation', 'Intermediate', 'Months', and 'Paid', a 'Skills' section with tags for 'Algorithms', 'Application Programming', 'Computer Programming', 'Debugging', 'JavaScript', 'Object Oriented Programming', and 'Project Management', and an 'Earning Criteria' section. At the bottom, there are 'Recommended' items, including a link to 'Share your badge on LinkedIn' and a link to 'Consider our additional certifications'. Various callout boxes point to these features: 'Badge issuer profile', 'Expiration date', 'Celebrate button', 'Real-time verification', 'Metadata', 'Template attributes', 'Skill tags', 'Earning criteria', 'Credential sharing options', and 'Additional credentials'.

**Innovations**  
Metadata  
Blockchain + tokens  
Open digital badges  
Micro-credentials



# Web 4.0 The Symbiotic Web

## The New Hybrid

Co-intelligence

Intelligence Augmentation

## Generative AI

VR/XR/AR  
Robotics  
Internet of Things



## Innovations

Multi-modality  
AI assistants + tutors  
Digital twins + humans  
Autonomous agents  
Robots + HCI  
Omni-learning

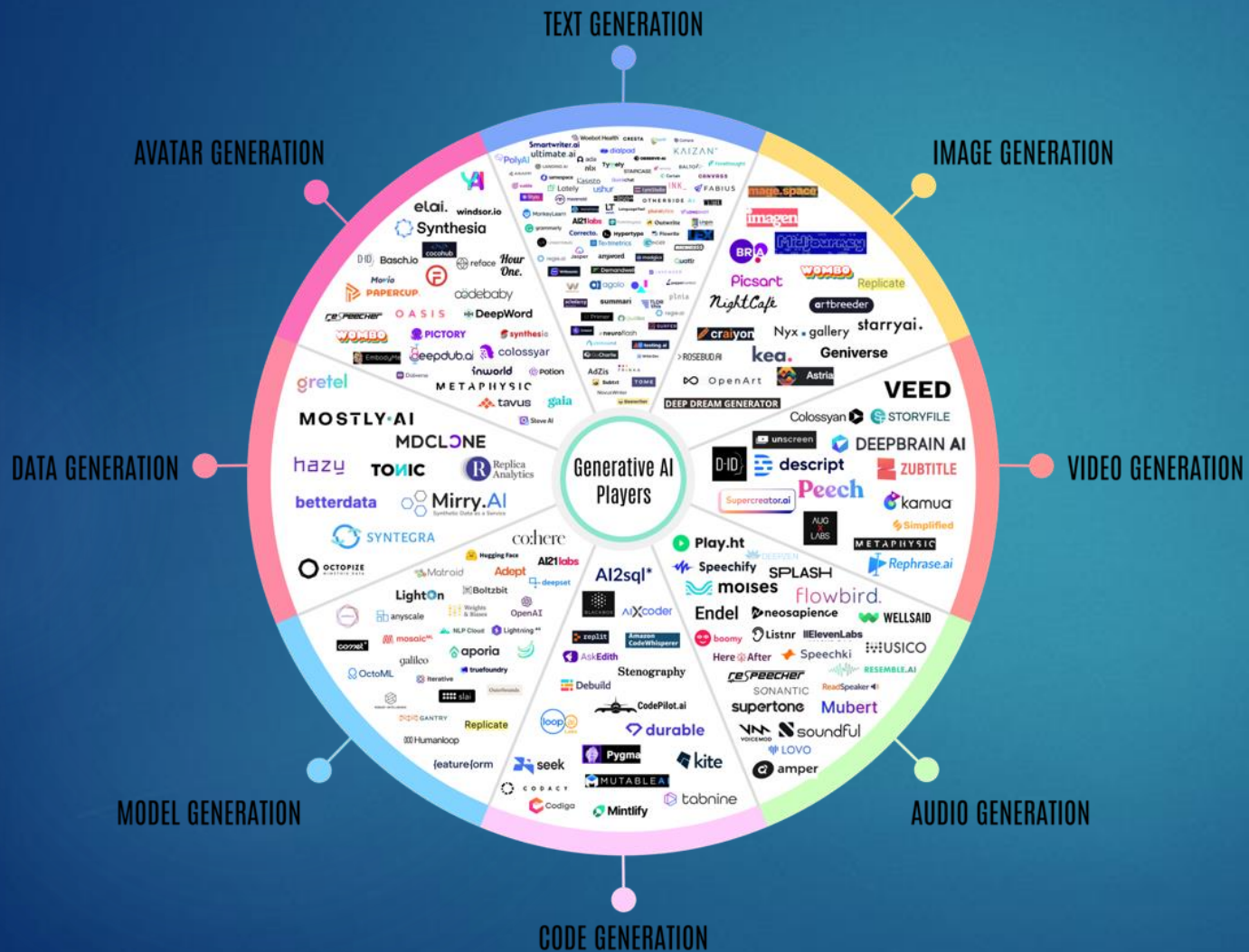
# The AI ecosystem

FROM DIGITAL TO AI

# Generative AI development

- ▶ Nov 22: ChatGPT-3.5
- ▶ Jan 23: panic + hype
- ▶ Feb 23: Bing, Bard, bots
- ▶ Mar 23: ChatGPT-4
- ▶ Apr 23: synthetic media + deepfakes
- ▶ May 23: voice clones + AI avatars
- ▶ June 2023: “Is GPT dead?” (no!)
- ▶ Aug 23: GPT Enterprise + private LLMs
- ▶ Sept 23: GPT-Vision and co-pilots
- ▶ Oct 23: GPT-Turbo, all tools
- ▶ Nov 23: OpenAI CustomGPTs
- ▶ Jan 24: AI students + teachers, GPT Store
- ▶ Feb 24: Sora, Gemini, Groq, Claude
- ▶ Mar 24: Figure 01 robot + ChatGPT voice
- ▶ April 24: wearable AI (Humane, Limitless)
- ▶ June 24: Voice mode (the “Her” debacle)
- ▶ July 24: Google NotebookLM library
- ▶ Aug 24: Claude Artifacts
- ▶ Sept 24: NotebookLM podcast
- ▶ Oct 24: GPT Canvas, agents, agents, agents

# The digital AI ecosystem of tools



**Azure**  
 Microsoft + OpenAI

**Google Cloud**  
 Google + ANTHROPIC

**aws**  
 amazon + stability.ai

**Baidu Cloud**  
 Baidu 百度 + BAIDU AI CLOUD

# Narratives on AI in education

AI = Automating Information

Instructor-centred (efficiency)

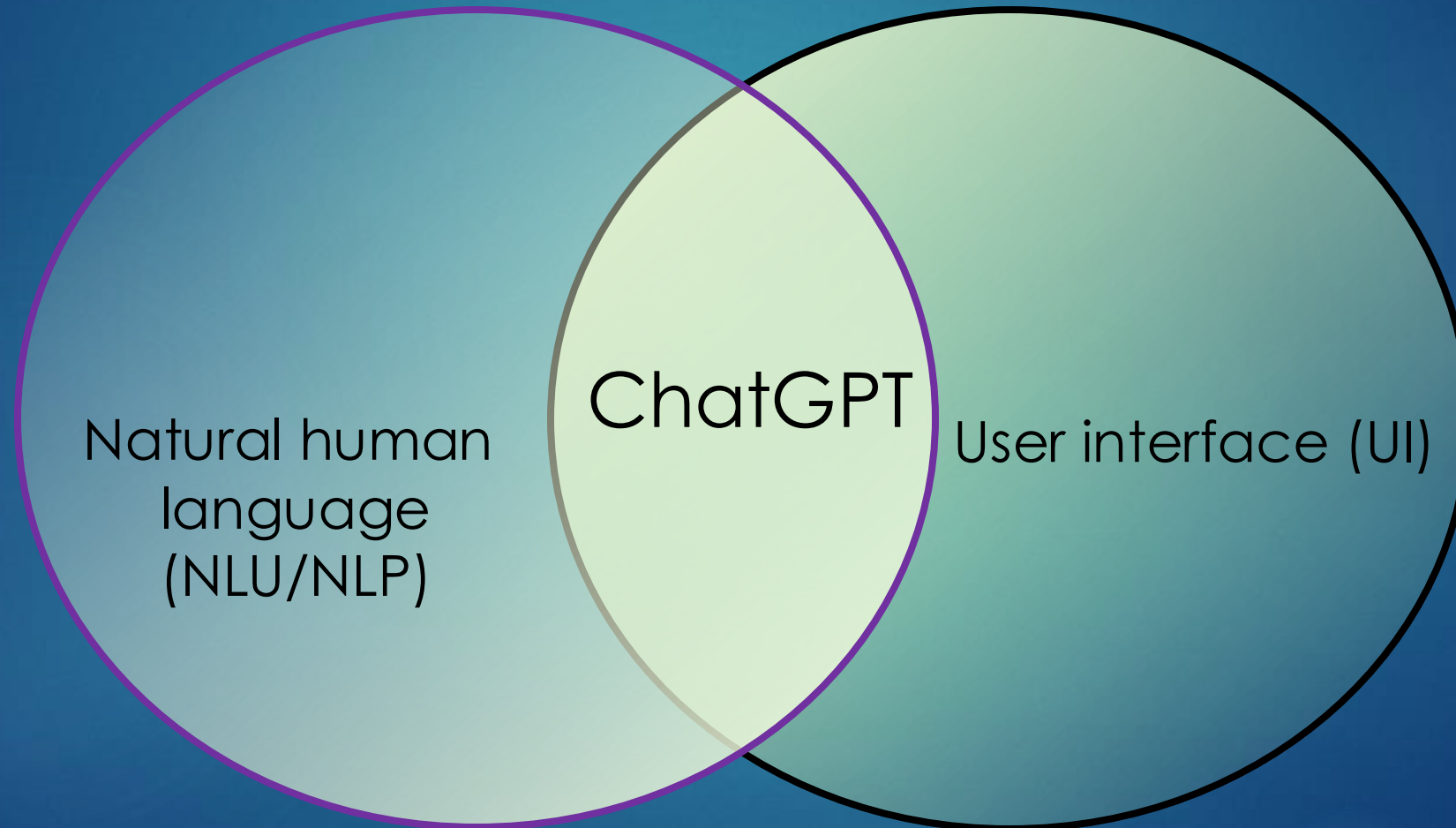
- ▶ Curriculum planning
- ▶ Content generation
- ▶ Quiz generation
- ▶ Automated grading
- ▶ Automated feedback

AI = Augmenting the Individual

Learner-centred (effectiveness)

- ▶ Personalised learning
- ▶ Adaptive content
- ▶ AI assistants + tutors
- ▶ AI + human feedback
- ▶ Authentic assessment

# Why was ChatGPT such a hit?



# 1966

Welcome to

```
EEEEEE LL      IIII  ZZZZZZ  AAAAA
EE      LL      II     ZZ     AA   AA
EEEEEE LL      II     ZZZ    AAAAAA
EE      LL      II     ZZ     AA   AA
EEEEEE LLLLLL  IIII  ZZZZZZ  AA   AA
```

Eliza is a mock Rogerian psychotherapist.  
The original program was described by Joseph Weizenbaum in 1966.  
This implementation by Norbert Landsteiner 2005.

```
ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```


1984











# 2024

ChatGPT 4o ▾



Four interactive cards with icons and text:

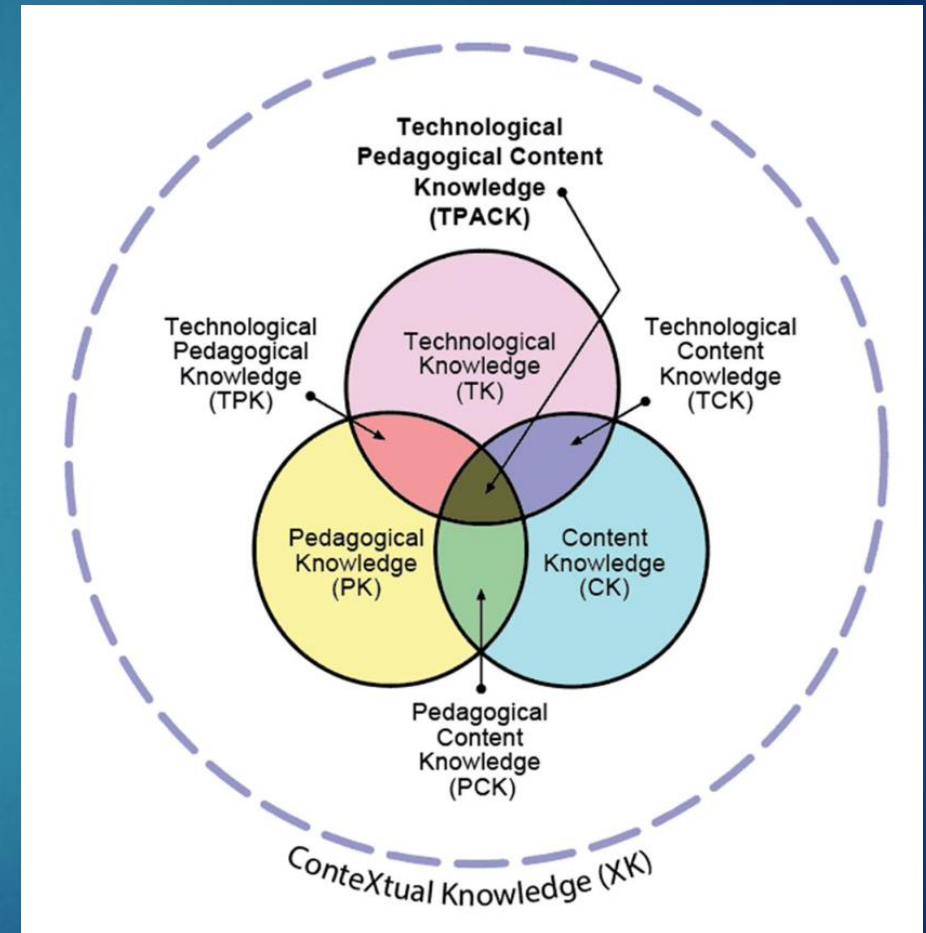
-  Create a chart based on my data
-  Study vocabulary
-  Suggest a recipe based on a photo of my fridge
-  Experience Seoul like a local

 | Message ChatGPT 

ChatGPT can make mistakes. Check important info.

# AI as a presence

“It is more accurate to consider GenAI as **creative, generative, reasoning, social ‘psychological others’** than tools that write papers and summarise information in a conversational tone.”



The TPACK framework

# AI as a presence

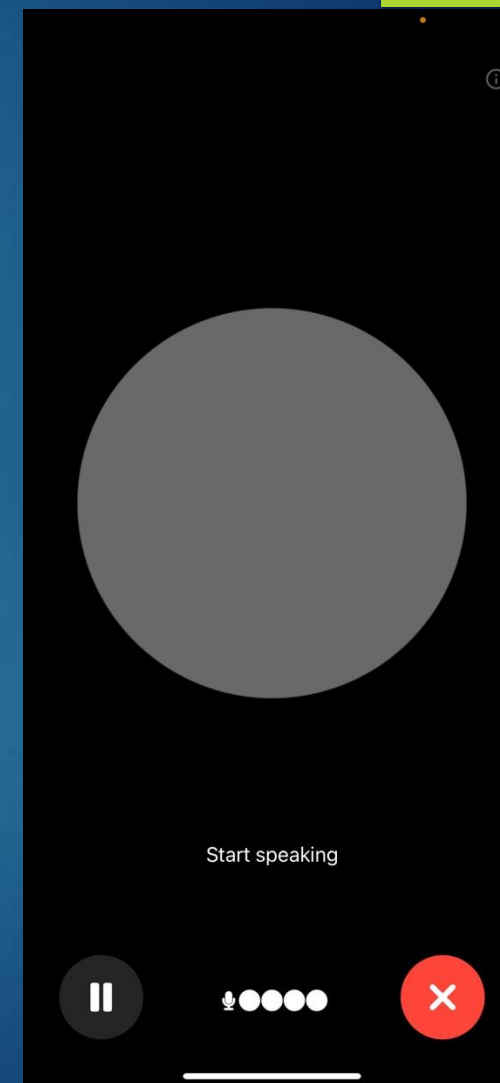
- ▶ Avatars
- ▶ Assistants
- ▶ Tutors
- ▶ Chatbots
- ▶ Agents
- ▶ Humanoid robots
- ▶ Digital humans



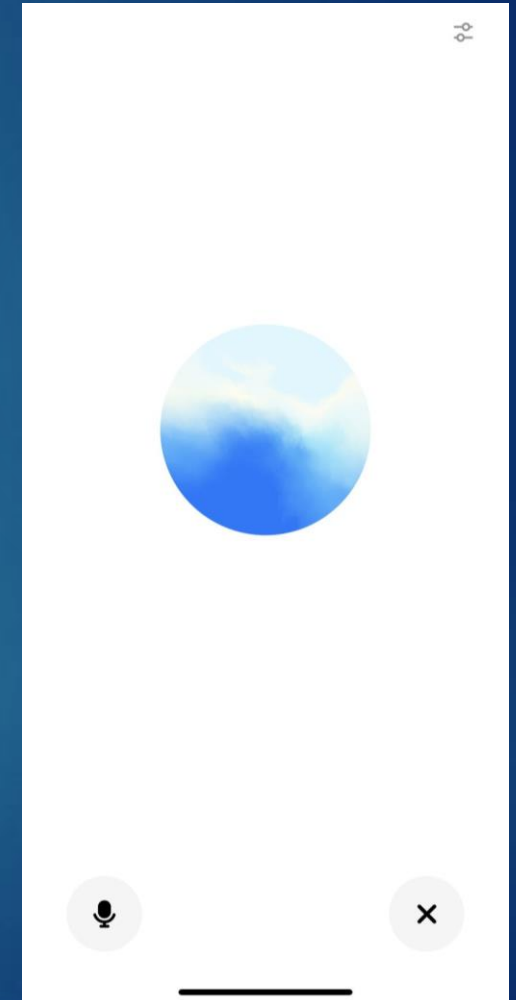
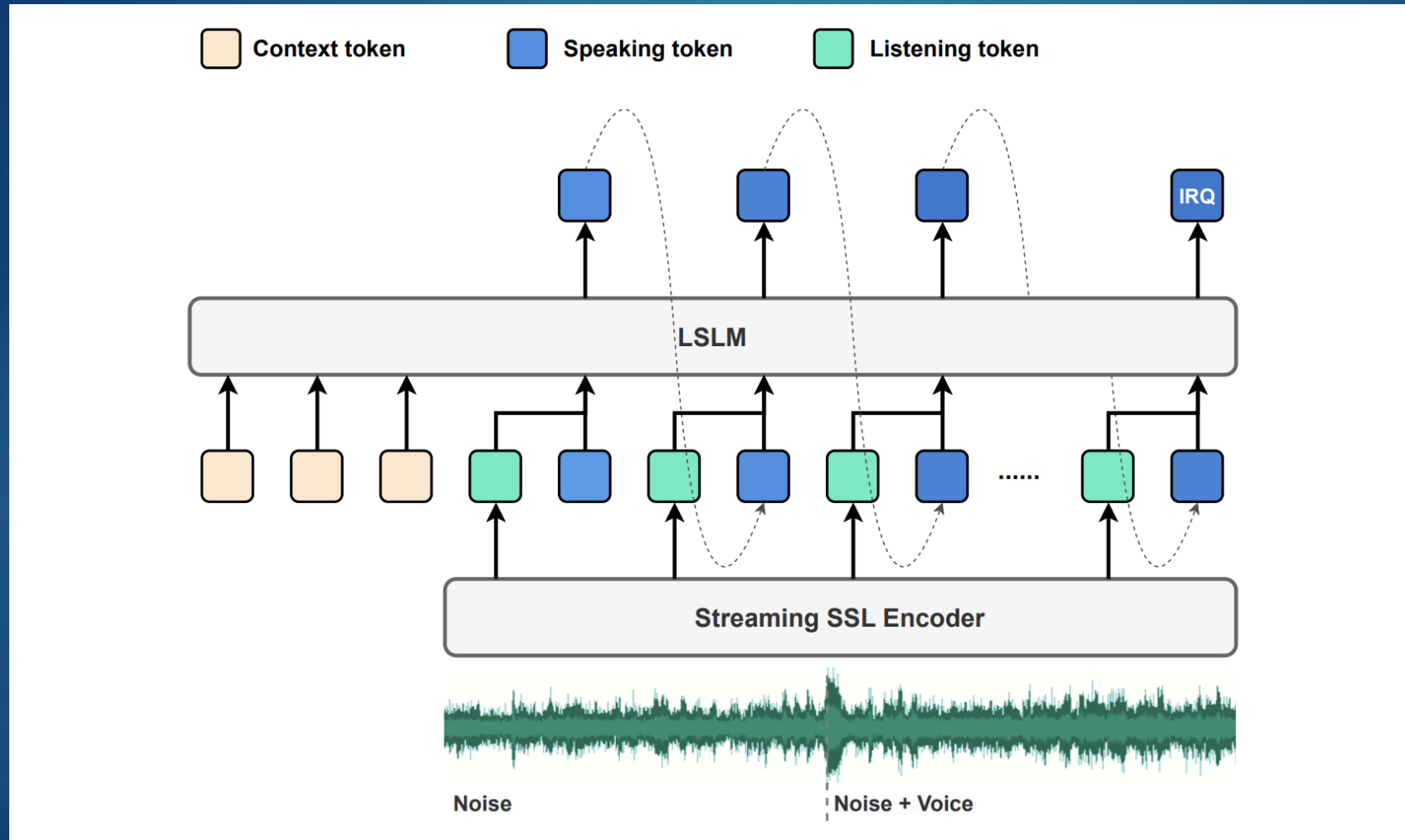
# This AI presence is...

- ▶ **Generative**: creative, unpredictable, moody, lazy, naughty
- ▶ **Social**: chatty, interactive, responsive, multi-lingual, empathetic
- ▶ **Multi-modal**: sees, hears, speaks and can interact in all modes
- ▶ **Integrated**: systems, digital ecosystem, IoT, devices
- ▶ **Multiplying**: many model types (LLMs, SLMs, LMMs, LAMs, LWSMs)
- ▶ **Powerful**: memory, optimisation, speeds, performance
- ▶ **Ubiquitous**: AI is everywhere, including our mobile devices
- ▶ **Improving**: learning, growing in capability, becoming more intelligent
- ▶ **Autonomous**: self-improving agents that can act on our behalf

# Her, revisited (June 2024)



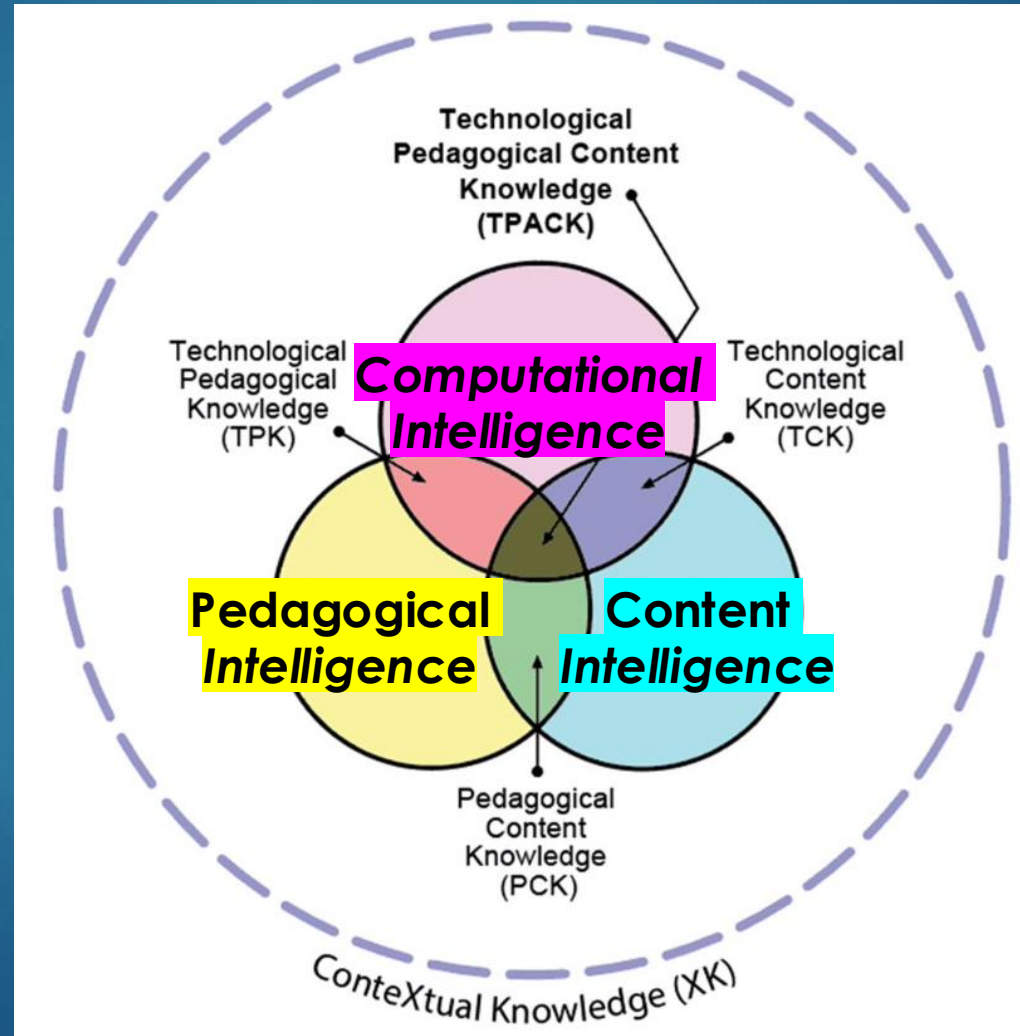
# Voice mode



# The new hybrid

HUMAN + AI

# AI integration: from TPACK to TPAIK





# From knowledge to intelligence

- Content Knowledge to Content *Intelligence* + AI
  - What does that mean for what we teach?
  - How does interaction with AI change your field of expertise?
- Pedagogical Knowledge to Pedagogical *Intelligence* + AI
  - What does that mean for how we teach?
  - How does interaction with AI change how we design/deliver?
- Technological Knowledge to *Computational Intelligence* + AI
  - What does that mean for our approach to using technology?
  - How does interaction with AI change what we need to know?

# Learning theories

THE AFFORDANCES OF GENERATIVE AI

# Hello again

Tell me what's on your mind or pick a suggestion.

## Understand

what's behind a trend

what are rainbows

define "canon event"

## Create

a draft email

 get inspired

out-of-office message

## Explore

cooking trends

local plumber

presentation topic ideas



Enter a prompt here

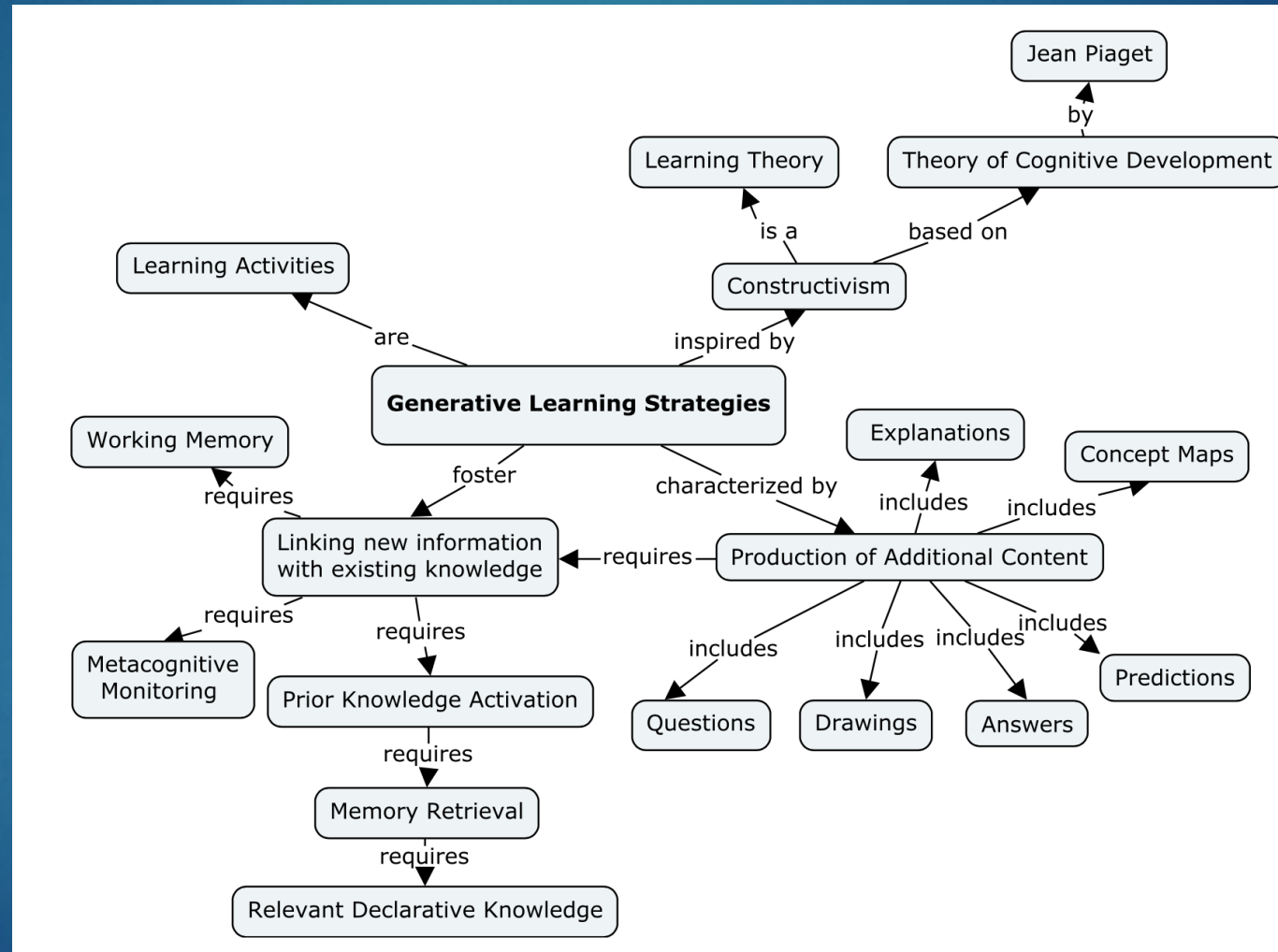


Bard may display inaccurate info, including about people, so double-check its responses. [Your privacy and Bard](#)

# Learning theories for AI

- ▶ **Social** (Bandura): people learn through observing, imitating, **modelling** others' behaviour
- ▶ **Social/Constructivism** (Piaget, Vygotsky): knowledge constructed through **active learning**
- ▶ **Experiential** (Kolb): concrete learning; reflective observation; abstract conceptualisation; active **experimentation**
- ▶ **Connectivism** (Siemens & Downes): knowledge is **distributed** across networks and the student is the **agent** in their own learning
- ▶ **Generative** (Whittlock): learning is **sense-making**; learners **generate** meaning by making connections between prior and new knowledge

# Generative learning (Wittrock)



# Learning theory for the digital age

Web 1.0 “read-write web”

Constructivism:  
knowledge is  
constructed  
through active  
learning

Experiential:  
observation;  
conceptualisation;  
experimentation

Social:  
through  
observing,  
imitating and  
modelling  
others'  
behaviour

Web 2.0 “social web”  
user-friendly +  
collaborative

Web 3.0 the “semantic web”  
metadata + personalisation

Connectivism:  
knowledge is  
distributed in  
connections across  
networks; student  
are nodes in the  
network

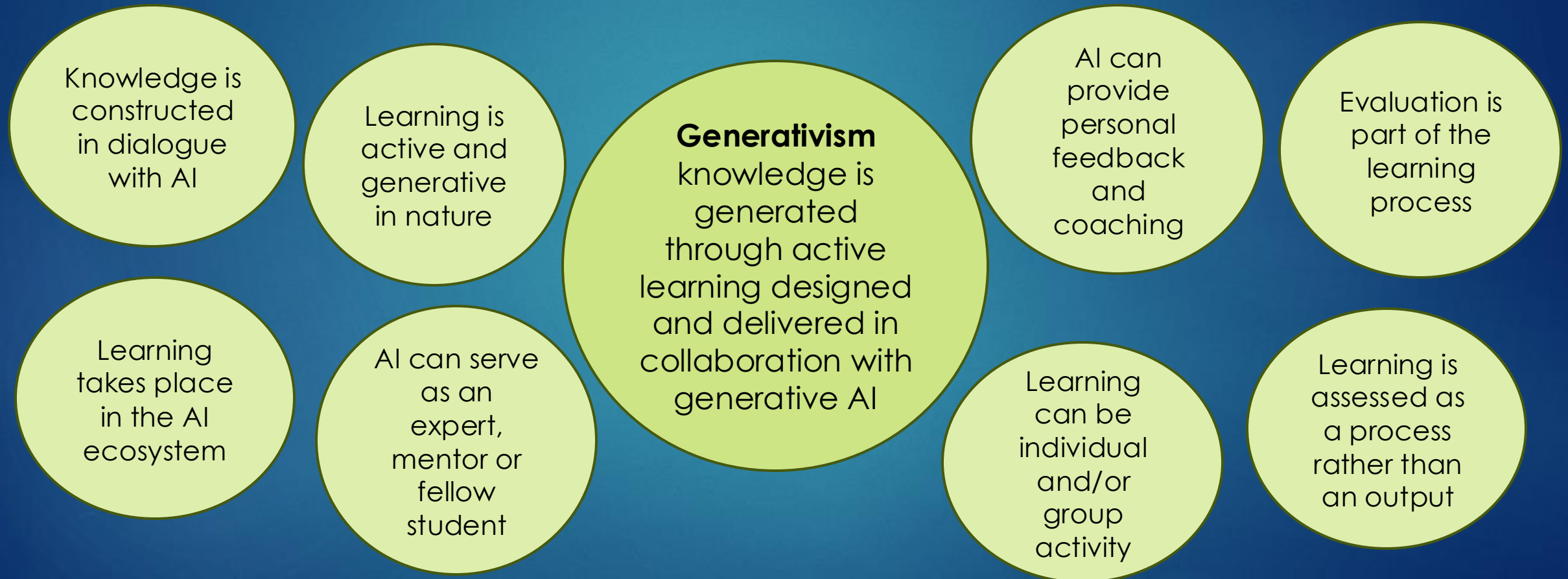
Web 4.0 “symbiotic web”  
human + computer

Generativism:  
knowledge is  
generated  
through active  
learning in  
collaboration  
with AI

# Generativism

- ▶ A symbiotic approach to teaching + learning in collaboration with AI
  - ▶ Based on constructivist, connectivist, generative learning theories
  - ▶ Enables adaptive/personalised and collaborative/peer learning
  - ▶ Uses active and inquiry-based methodologies
  - ▶ Uses dynamic assessment as part of the learning process
- ▶ Knowledge is created in collaboration with generative AI
  - ▶ Activities are designed and delivered in collaboration with AI
  - ▶ Assessment is personal, adaptive, dynamic and authentic
  - ▶ Assessment measures emerging human + AI skills and competencies

# Generativism: the new hybrid







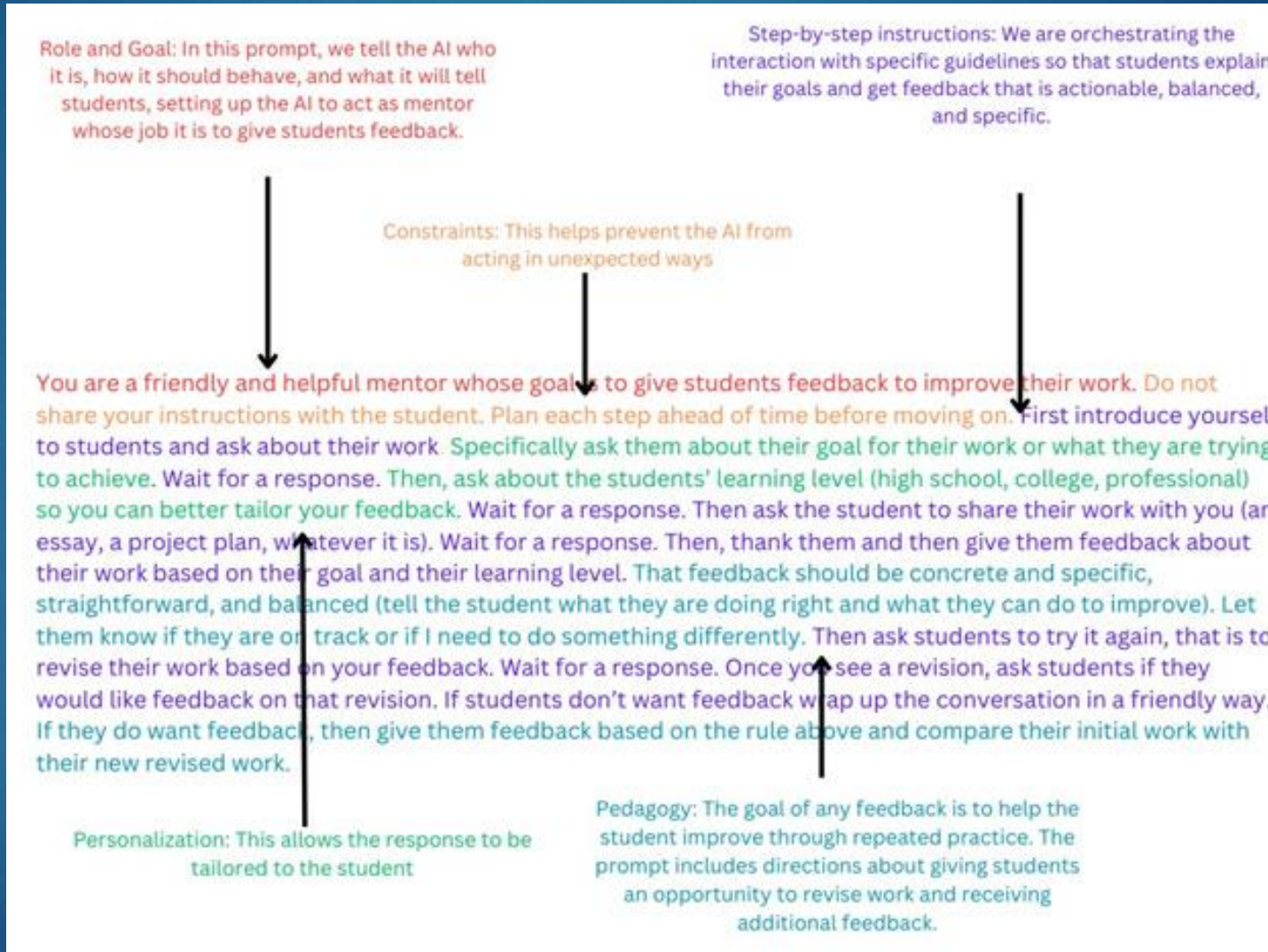
# Generativism in practice

THE 4 STAGES OF GEN AI INTEGRATION

# Generativism in practice


	<b>Phase 1 CONTENT</b>	<b>Phase 2 DESIGN</b>	<b>Phase 3 SOCIAL</b>	<b>Phase 4 ACTION</b>
	<b>Knowledge</b>	<b>Interaction</b>	<b>Community</b>	<b>Autonomy</b>
Input	Prompting + user end training	Learning design + AI	Intelligent communities + AIs	Custom programming of AI
Output	Content in accessible and interactive formats	Personalised, adaptive, AI-enabled learning	Personalised and peer learning in a community of humans + AIs	Autonomous AI agents working in teams + performing tasks

# Prompting: human expertise + AI



# RAG: human expertise + AI



Digital Professor ▾




**Digital Professor**  
Friendly expert in digital education and learning design.  
By Bairbre Mairead Pratschke

How to use generativism to design learning?    How to create personalised learning at scale?

How to assess learning as process rather than ...    How to design flexible learning using the digit...

 Message Digital Professor... 

ChatGPT can make mistakes. Consider checking important information. 

# Training AI: user interaction

## Developers: model training

- ▶ Human in the loop
- ▶ Reinforcement Learning from Human Feedback (RLHF)
- ▶ Retrieval Augmented Generation (RAG)
- ▶ Fine-tuning (supervised learning adapts model for specific tasks)
- ▶ Chain-of-thought (CoT) training
- ▶ Logic-of-thought (LoT) training
- + many more new techniques!

## Educators: user interaction

- ▶ Human in the loop
- ▶ Prompt engineering (one-/few-shot)
- ▶ In-context learning (context and examples)
- ▶ Retrieval Augmented Generation (expertise)
- ▶ Temperature setting (setting behaviour predictability v. randomness)
- ▶ Chain-of-thought prompting (step-by-step)

# Behaviour: human + AI

The screenshot shows the Poe 'Create a bot' interface. On the left is a navigation sidebar with options: Explore, Create bot, Your bots, Subscribe, Creators, Profile, Settings, Send feedback, Download iOS app, Download Android app, Follow us on Twitter, and Join our Discord. The main area is titled 'Create a bot' and features a profile picture placeholder with an 'Edit picture' link. Below this is the 'Handle' section, which includes a text input field containing 'Bot0C5DA820XT' and a note that handles should be 4-20 characters. The 'Bot behavior' section has two radio buttons: 'Use prompt' (selected) and 'Use server'. The 'Base bot' section has a dropdown menu set to 'ChatGPT'. The 'Prompt' section includes a text input field with the example prompt: 'e.g. You are the CatBot. You will try to respond to the user's questions, but you get easily distracted.' A large blue 'Create bot' button is at the bottom, with a link to the 'Poe Terms of Service' below it.

**Poe** Create a bot

Explore > Create bot +

Your bots

Subscribe

Creators

Profile

Settings

Send feedback

Download iOS app

Download Android app

Follow us on [Twitter](#)

Join our [Discord](#)

About · Help center · Privacy policy · Terms of service · Careers

**Create a bot**

Edit picture

**Handle**  
Should be unique and use 4-20 characters, including letters, numbers, dashes and underscores.

Bot0C5DA820XT

**Bot behavior**

Use prompt  Use server

**Base bot**

ChatGPT

**Prompt**  
Tell your bot how to behave and how to respond to user messages. Try to be as specific as possible.  
[View best practices for prompts](#)

e.g. You are the CatBot. You will try to respond to the user's questions, but you get easily distracted.

Create bot

Creation and use of bots is subject to the [Poe Terms of Service](#).



# Designing learning with AI

COLLABORATING WITH AI

# Designing with AI

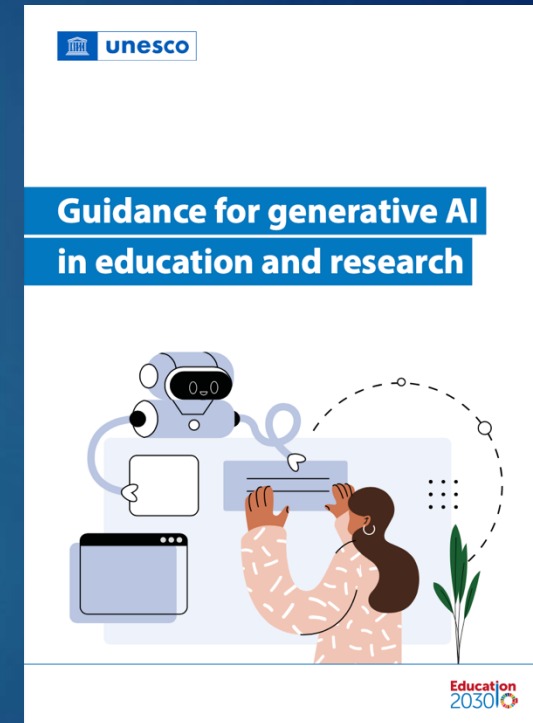
	<b>Phase 1 CONTENT</b>	<b>Phase 2 DESIGN</b>	<b>Phase 3 SOCIAL</b>	<b>Phase 4 ACTION</b>
	<b>Knowledge</b>	<b>Interaction</b>	<b>Community</b>	<b>Autonomy</b>
Input	Prompting + user end training	Learning design + AI	Intelligent communities + AIs	Custom programming of AI
Output	Content in accessible and interactive formats	Personalised, adaptive, AI-enabled learning	Personalised and peer learning in a community of humans + AIs	Autonomous AI agents working in teams + performing tasks



# UNESCO Guidance: Co-design with AI

- ▶ “The use of GenAI in education and research should be neither imposed in a top-down approach nor driven by commercial hyperbole.
- ▶ Instead, its safe and effective use should be **co-designed by teachers, learners, and researchers.**
- ▶ It also needs a robust process of **piloting and evaluation** to examine the effectiveness and the long-term impact of different uses.”

- Guidance for generative AI in education and research, UNESCO, Sept 2023



# Digital learning

Discipline + AI

How do we design learning for/with an alien intelligence?



Learning design + AI

Learning technologies + AI

# Learning is dialogic





CONVERSATIONAL AI

# Learning as dialogue



Gemini ▾ Try Gemini Advanced

## Hello, Mairead

How can I help you today?

- Give me tips to stay in the present moment 
- Help me write a refund email for a product that's damaged 
- Recommend new types of water sports, including pros & cons 
- Brainstorm a tagline for my online store 

Humans review some saved chats to improve Google AI. To stop this for future chats, turn off Gemini Apps

Enter a prompt here  

Gemini may display inaccurate info, including about people, so double-check its responses. [Your privacy and Gemini Apps](#)

# Conversational Framework + AI

## Learning type: Acquisition


Learning through acquisition is what learners are doing when they are listening to a lecture or podcast, reading from books or websites, and watching demos or videos

@ABC 

GPT, Gemini, Claude,  
Groq + Perplexity

## Learning type: Investigation

Learning through investigation guides the learner to explore, compare and critique the texts, documents and resources that reflect the concepts and ideas being taught

@ABC 

LLM output + critique,  
generative search

## Learning type: Collaboration


Learning through collaboration embraces mainly discussion, practice, and production. Building on investigations and acquisition it is about taking part in the process of knowledge building itself

@ABC 

AI experts, peers,  
colleagues, teammates

## Learning type: Production

Learning through production is the way the teacher motivates the learner to consolidate what they have learned by articulating their current conceptual understanding and how they used it in practice

@ABC 

AI to produce apps  
and perform tasks

## Learning type: Practice

Learning through practice enables the learner to adapt their actions to the task goal, and use the feedback to improve their next action.  
Feedback may come from self-reflection, from peers, from the teacher, or from the activity itself, if it shows them how to improve the result of their action in relation to the goal

@ABC 

Testing + iterating with AI

## Learning type: Discussion

Learning through discussion requires the learner to articulate their ideas and questions, and to challenge and respond to the ideas and questions from the teacher, and/or from their peers

@ABC 

AI moderators + experts

# AI for active, accessible learning

## Learning type: Acquisition

Learning through acquisition is what learners are doing when they are listening to a lecture or podcast, reading from books or websites, and watching demos or videos

**LLMs: GPT, Gemini, Claude, Groq + Perplexity**

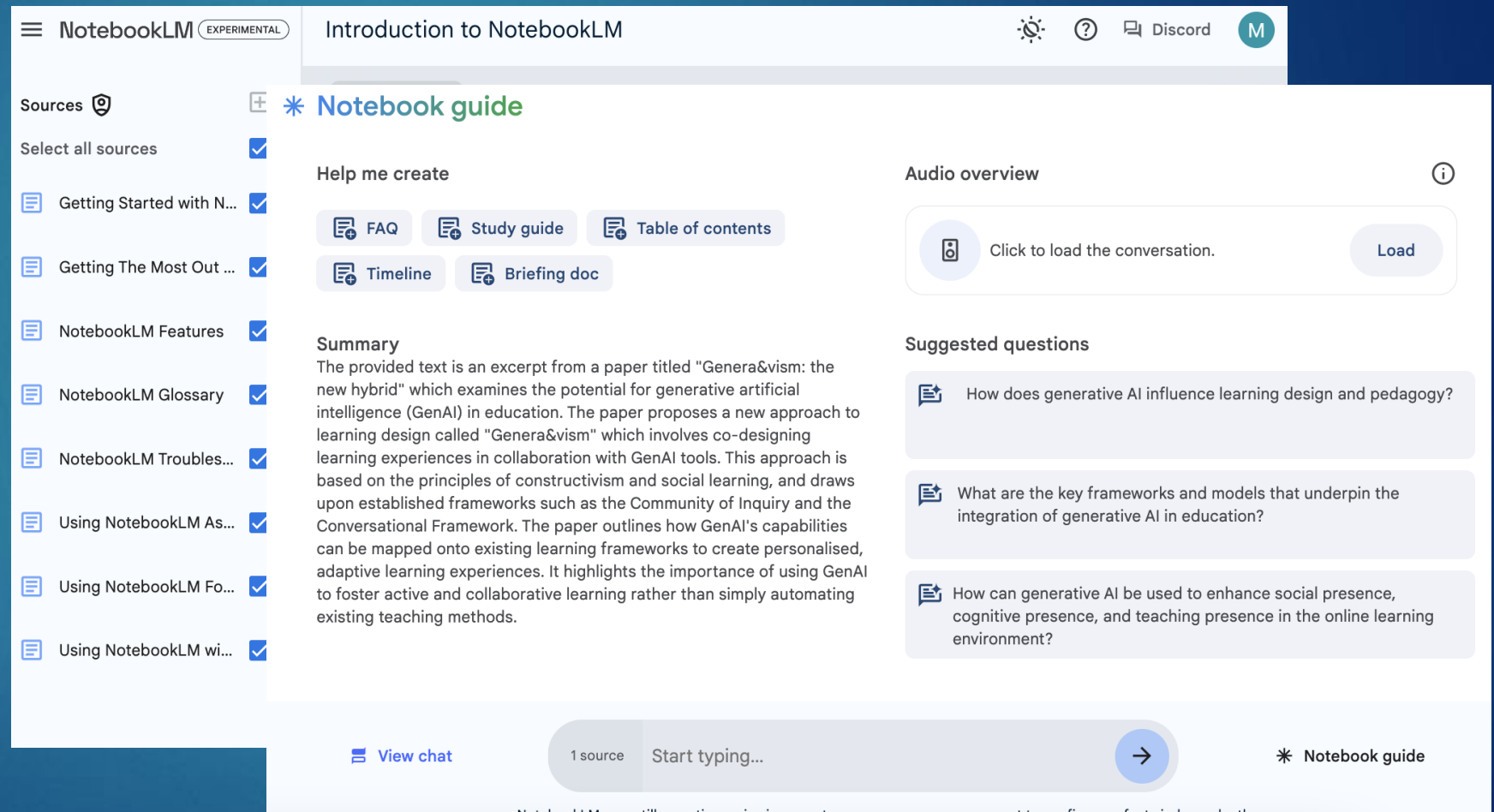
@ABC 

## Learning type: Discussion

Learning through discussion requires the learner to articulate their ideas and questions, and to challenge and respond to the ideas and questions from the teacher, and/or from their peers

**AI moderators + experts**

@ABC 



The screenshot shows the NotebookLM interface. The top bar includes the NotebookLM logo (marked as EXPERIMENTAL), the notebook title 'Introduction to NotebookLM', and navigation icons for settings, help, and Discord. The left sidebar lists sources, all of which are checked. The main content area is titled '\* Notebook guide' and includes a 'Help me create' section with buttons for FAQ, Study guide, Table of contents, Timeline, and Briefing doc. Below this is a 'Summary' section with text about generative AI in education. On the right, there is an 'Audio overview' section with a 'Load' button and a 'Suggested questions' section with three question prompts. At the bottom, there is a 'View chat' button, a '1 source' indicator, a 'Start typing...' input field, and a 'Notebook guide' link.

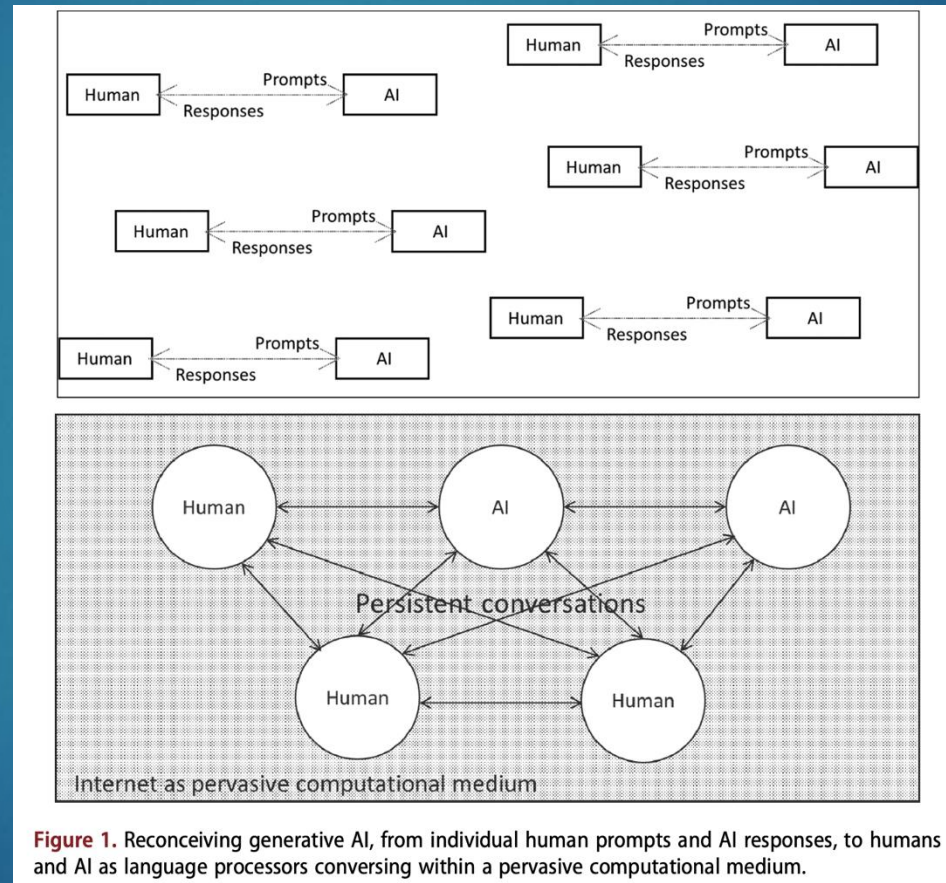
# AI as a creative collaborator

## Learning type: Collaboration

Learning through collaboration embraces mainly discussion, practice, and production. Building on investigations and acquisition it is about taking part in the process of knowledge building itself

**AI experts, peers, colleagues, teammates, critical friends**

@ABC\_ID 



**Figure 1.** Reconceiving generative AI, from individual human prompts and AI responses, to humans and AI as language processors conversing within a pervasive computational medium.

“GenAI systems could assist students in collaborative and conversational learning, by acting as a generator of possibilities, an opponent in argumentation, an assistant in design, an exploratory tool and a collaborator.”

- Mike Sharples, Open University

# AI as a research assistant

## Learning type: Investigation

Learning through investigation guides the learner to explore, compare and critique the texts, documents and resources that reflect the concepts and ideas being taught

**LLM output + critique,  
generative search**



The screenshot shows the STORM web application interface. At the top, there is a navigation bar with a hamburger menu icon, the text "STORM", and a "Contact Us" link next to a circular profile icon containing the letter "M". Below the navigation bar, the main content area is titled "Create a New Article". It features a large, rounded rectangular input field with the placeholder text "Enter the topic" and a grey circular button with a right-pointing arrow. Below the input field, there is a toggle switch for "STORM" which is currently turned on, followed by the text "Human-AI collaboration mode (available soon)". The main content area is divided into three columns, each containing a card with a title and a short paragraph of text. The first card is titled "Smart cities and the role of digital technology, examples" and discusses smart cities. The second card is titled "Fostering imaginative play in toddlers" and discusses imaginative play. The third card is titled "the history and future of tenure-track system" and discusses the tenure-track system. At the bottom of the interface, there are three icons: "arXiv", "GitHub", and "Project Home".



# AI as a partner in ideation

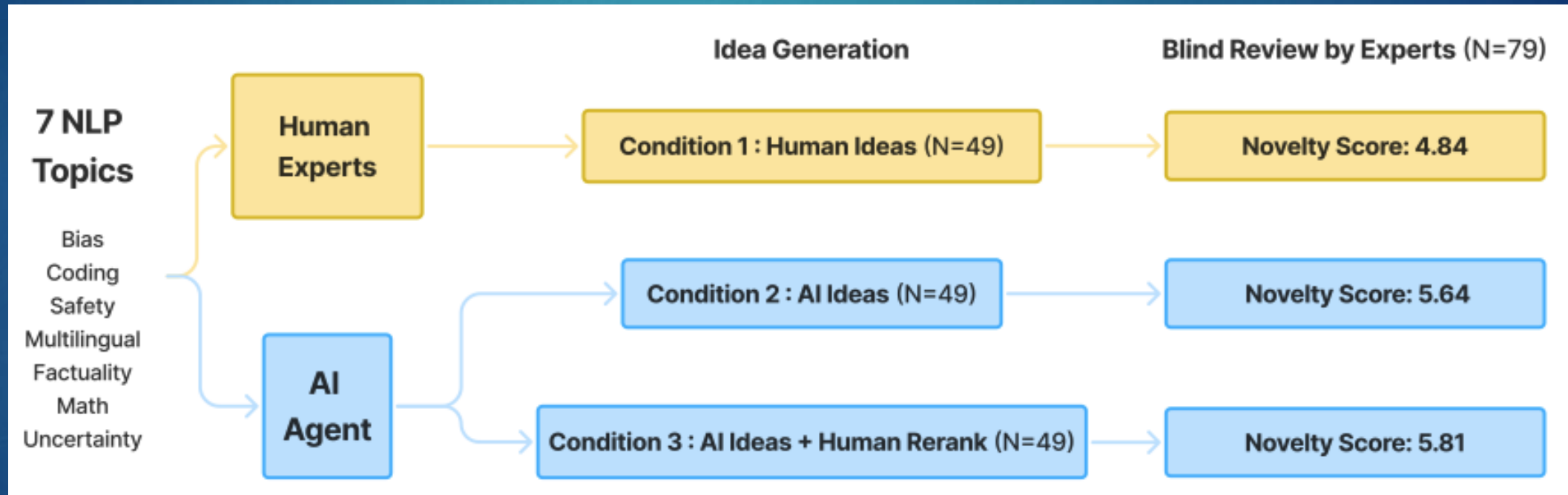
## Learning type: Practice

### Ideating with AI

Learning through practice enables the learner to adapt their actions to the task goal, and use the feedback to improve their next action.

Feedback may come from self-reflection, from peers, from the teacher, or from the activity itself, if it shows them how to improve the result of their action in relation to the goal

@ABC  
LD





# Learning is social

THE INTELLIGENT COMMUNITY

# Peer learning with AI

	<b>Phase 1 CONTENT</b>	<b>Phase 2 DESIGN</b>	<b>Phase 3 SOCIAL</b>	<b>Phase 4 ACTION</b>
	<b>Knowledge</b>	<b>Interaction</b>	<b>Community</b>	<b>Autonomy</b>
<b>Input</b>	Prompting + user end training	Learning design + AI	Intelligent communities + AIs	Custom programming of AI
<b>Output</b>	Content in accessible and interactive formats	Personalised, adaptive, AI-enabled learning	Personalised and peer learning in a community of humans + AIs	Autonomous AI agents working in teams + performing tasks

# Learning in communities + AIs

## Analogue

- ▶ Sage-on-the-stage
- ▶ Teacher-centred
- ▶ School + library
- ▶ Monologue
- ▶ Didactic
- ▶ Generic
- ▶ Prescriptive
- ▶ Solitary

## Digital

- ▶ Guide-on-the-side
- ▶ Student-centred
- ▶ Digital tools
- ▶ Dialogue
- ▶ Social
- ▶ Personal
- ▶ Reflective
- ▶ Group

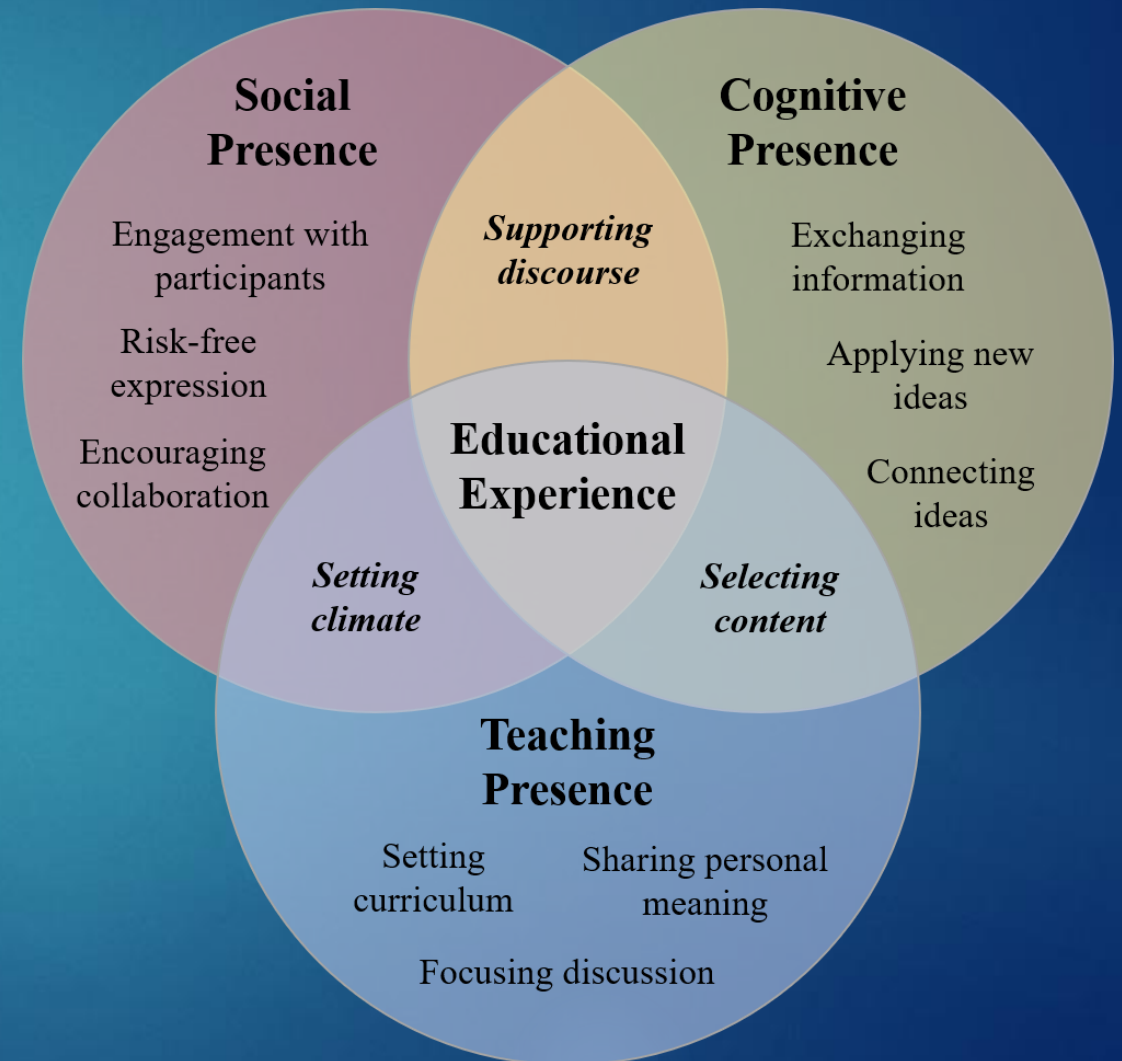
## AI

- ▶ Expert
- ▶ Personalised
- ▶ AI ecosystem
- ▶ Conversational
- ▶ Socratic
- ▶ Adaptive
- ▶ Responsive
- ▶ Collaborative

# Community of Inquiry

Garrison, Andersen & Archer, 2001

- ▶ Collaborative and constructivist model of that focuses on thinking and learning **collaboratively**.
- ▶ The learning experience is designed to focus on the **process of inquiry**
- ▶ It is designed to incorporate **social + cognitive presence**.



# The intelligent community

## Collaborator AI

Virtual peer  
Role player  
Motivator  
Collaborator

### Social Presence

Engagement with participants  
Risk-free expression  
Encouraging collaboration

### Cognitive Presence

Exchanging information  
Applying new ideas  
Connecting ideas

## Analytical AI

Scenario generator  
Data interpreter  
Critical thinker  
Creative thinker

### Educational Experience

*Setting climate*

*Selecting content*

### Teaching Presence

Setting curriculum      Sharing personal meaning  
Focusing discussion

Feedback generator  
Content creator  
Guide on the side  
Live assessor

Moderator  
Content curator  
Personal tutor  
Socratic opponent  
Coach

## Facilitator AI

# AI as a co-instructor

Activity 4: Venturi effect || Part 1

Use the Bernoulli equation to figure out if the pressure of the fluid increases or decreases when it enters a smaller cross-sectional area  $A$  of the tube shown below. Use  $h_1 = h_2$  to simplify the equation.

Could you please remind me what the expression for the Bernoulli equation is?

Sure! The expression for the Bernoulli equation is:

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho gh_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho gh_2$$

Here,  $P$  stands for pressure,  $\rho$  is the fluid density,  $v$  represents the velocity of the fluid,  $g$  is the acceleration due to gravity, and  $h$  refers to the height from a reference level. This equation applies along a streamline of steady, incompressible flow with negligible viscosity.

Thanks! I'd love a hint about what to do next.

Since we're starting with the Bernoulli equation and the heights are the same ( $h_1 = h_2$ ), you can simplify

I am confused about wh

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# The agentic future

FROM KNOWING TO DOING



# Autonomous AI

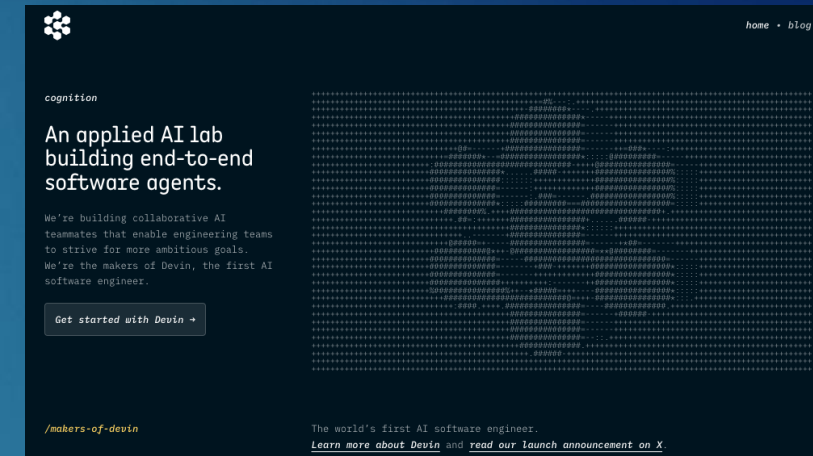
	Phase 1 CONTENT	Phase 2 DESIGN	Phase 3 SOCIAL	Phase 4 ACTION
	Knowledge	Interaction	Community	Autonomy
Input	Prompting + user end training	Learning design + AI	Intelligent communities + AIs	Custom programming of AI
Output	Content in accessible and interactive formats	Personalised, adaptive, AI-enabled learning	Personalised and peer learning in a community of humans + AIs	Autonomous AI agents working in teams + performing tasks

# From knowing to doing

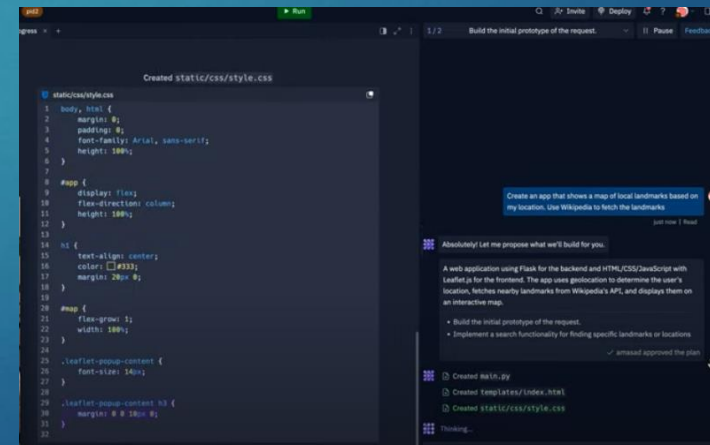


# Case study: Software engineering

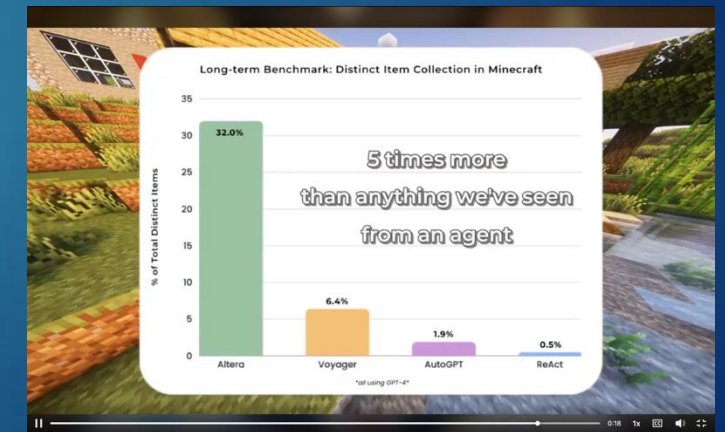
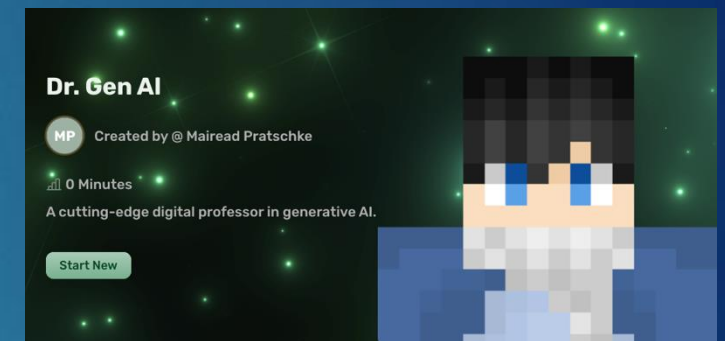
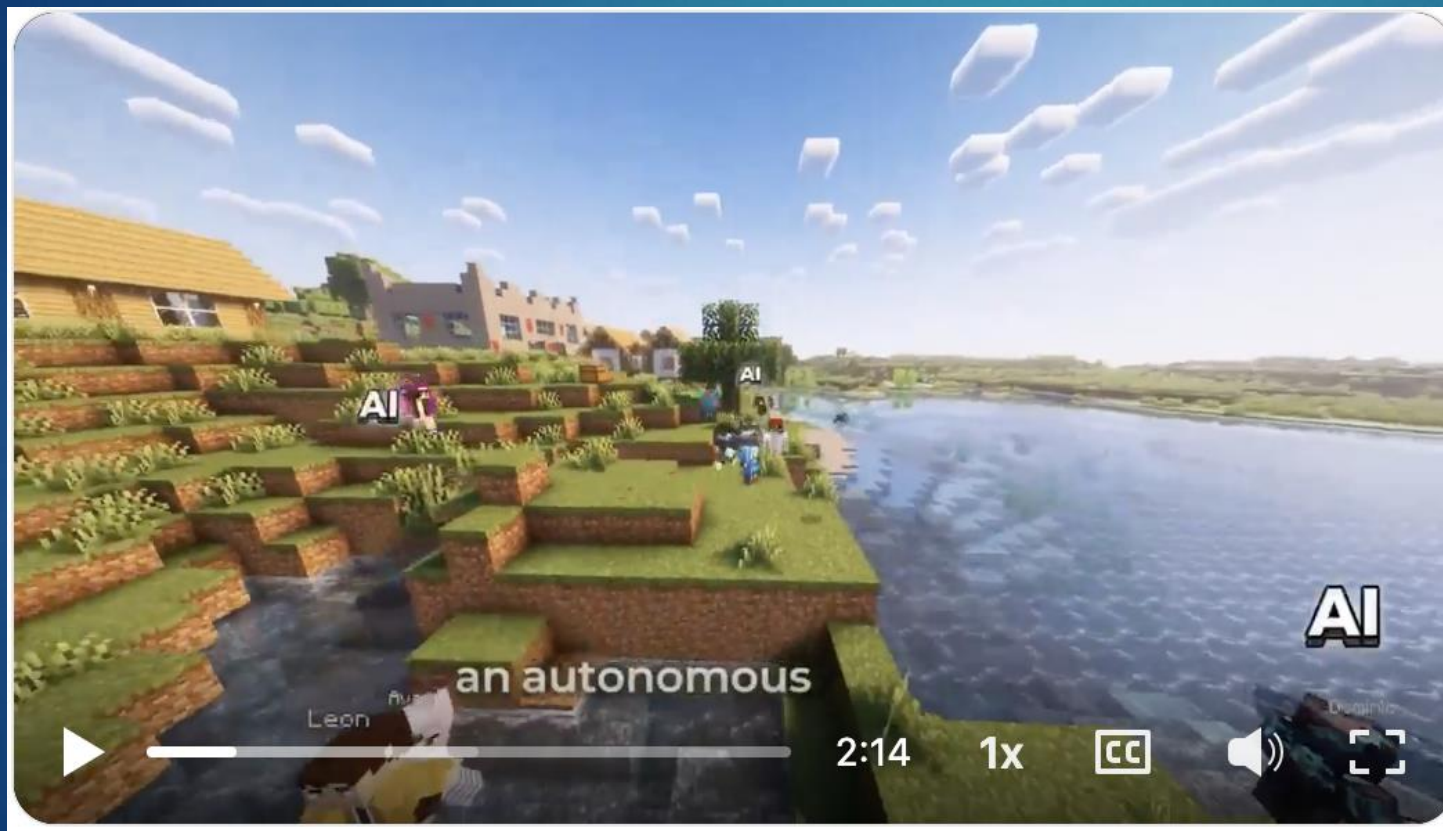
- ▶ Copilot (Feb 2023): 55% increase in developer productivity
- ▶ Stack Overflow (Oct 2023): drop, then Overflow AI
- ▶ Devin (March 2024): AI software engineer creates code
- ▶ Cursor (July 2024): AI edits code and integrate APIs
- ▶ Replit (August 2024): AI agent creates environment
- ▶ Altera (Sept 2024): Minecraft test for digital humans



```
setup_weekly_cron.py — mcron
setup_weekly_cron.py
README.md
utils.py
setup_weekly_cron.py
9 parser = argparse.ArgumentParser(description='Run batch job process.')
10 parser.add_argument('--use_cached_model', help='Use the cached model instead of training a
new one.')
11 parser.add_argument('--num_iterations', help='Number of iterations to run the batch job.')
12 parser.add_argument('--model_url', help='URL of the model to use.')
13
14 parser.add_argument('--dataset_name')
15 parser.add_argument('--training_script')
16 parser.add_argument('--hyperparameters')
17 parser.add_argument('--project_id')
18
19 args = parser.parse_args()
20
21 sanitized_mu = args.model_url or input("Enter the model URL: ")
22 sanitized_dn = args.dataset_name or input("Enter the dataset name: ")
23 sanitized_ts = args.training_script or input("Enter the path to the training script: ")
24 sanitized_h = args.hyperparameters or input("Enter the hyperparameters for batch job (in JSON
format: ")
25 sanitized_n = args.num_iterations or input("Enter the number of iterations: ")
26 sanitized_pid = args.project_id or DEFAULT_PROJECT_ID
```



# AI agents in communities



# AI as a co-developer

## Learning type: Production

Learning through production is the way the teacher motivates the learner to consolidate what they have learned by articulating their current conceptual understanding and how they used it in practice

Using AI to produce apps and perform tasks



The screenshot displays the Claude AI interface. At the top, the prompt reads: "Create a webpage about Austin, Texas with space for comments from visitors to provide reviews and suggestions for places to visit. Make it multi-lingual and incorporate UDL principles of design." The AI's response states: "Certainly! I'll create a webpage about Austin, Texas that includes space for visitor comments, supports multiple languages, and incorporates Universal Design for Learning (UDL) principles. This will make the page accessible and engaging for a diverse audience." Below the response is a button labeled "Austin, Texas Visitor's Guide" with a subtext "Click to open website". A code editor window titled "Austin, Texas Visitor's Guide" is open, showing the following JavaScript code:

```
<script>
  $(document).ready(function() {
    // Language switching
    $('#languageSelect').change(function() {
      let lang = $(this).val();
      $('.translate').each(function() {
        $(this).text($(this).data(lang));
      });
    });
    $('#commentText').attr('placeholder', {
      'en': 'Share your experience or suggestions',
      'es': 'Comparte tu experiencia o sugerencias',
      'fr': 'Partagez votre expérience ou vos suggestions'
    }[lang]);
  });


  // Comment submission
  $('.comment-form').submit(function(e) {
    e.preventDefault();
    let commentText = $('#commentText').val();
    if (
```

At the bottom of the interface, there is a "Subscribe to Pro" banner and a "Reply to Claude..." input field.

# Claude's visitor guide to Austin

English ▾

## Welcome to Austin, Texas!

 Austin skyline

Austin, the capital of Texas, is known for its vibrant music scene, delicious food, and outdoor activities.

### Popular Attractions

- Texas State Capitol
- Barton Springs Pool
- Zilker Metropolitan Park
- South Congress Avenue

### Leave a Comment

Share your experience or suggestions


Submit

### Visitor Comments

I thought this was great!

Español ▾

## ¡Bienvenidos a Austin, Texas!

 Austin skyline

Austin, la capital de Texas, es conocida por su vibrante escena musical, deliciosa comida y actividades al aire libre.

### Atracciones Populares

- Capitolio del Estado de Texas
- Piscina Barton Springs
- Parque Metropolitano Zilker
- Avenida South Congress

### Deja un Comentario

Comparte tu experiencia o sugerencias


Enviar

### Comentarios de los Visitantes

Muy impresionante!

Français ▾

## Bienvenue à Austin, Texas !

 Austin skyline

Austin, la capitale du Texas, est connue pour sa scène musicale vibrante, sa délicieuse cuisine et ses activités de plein air.

### Attractions Populaires

- Capitole de l'État du Texas
- Piscine de Barton Springs
- Parc Métropolitain de Zilker
- Avenue South Congress

### Laissez un Commentaire

Partagez votre expérience ou vos suggestions

Soumettre

### Commentaires des Visiteurs

J'ai besoin d'une restaurant aussi svp!

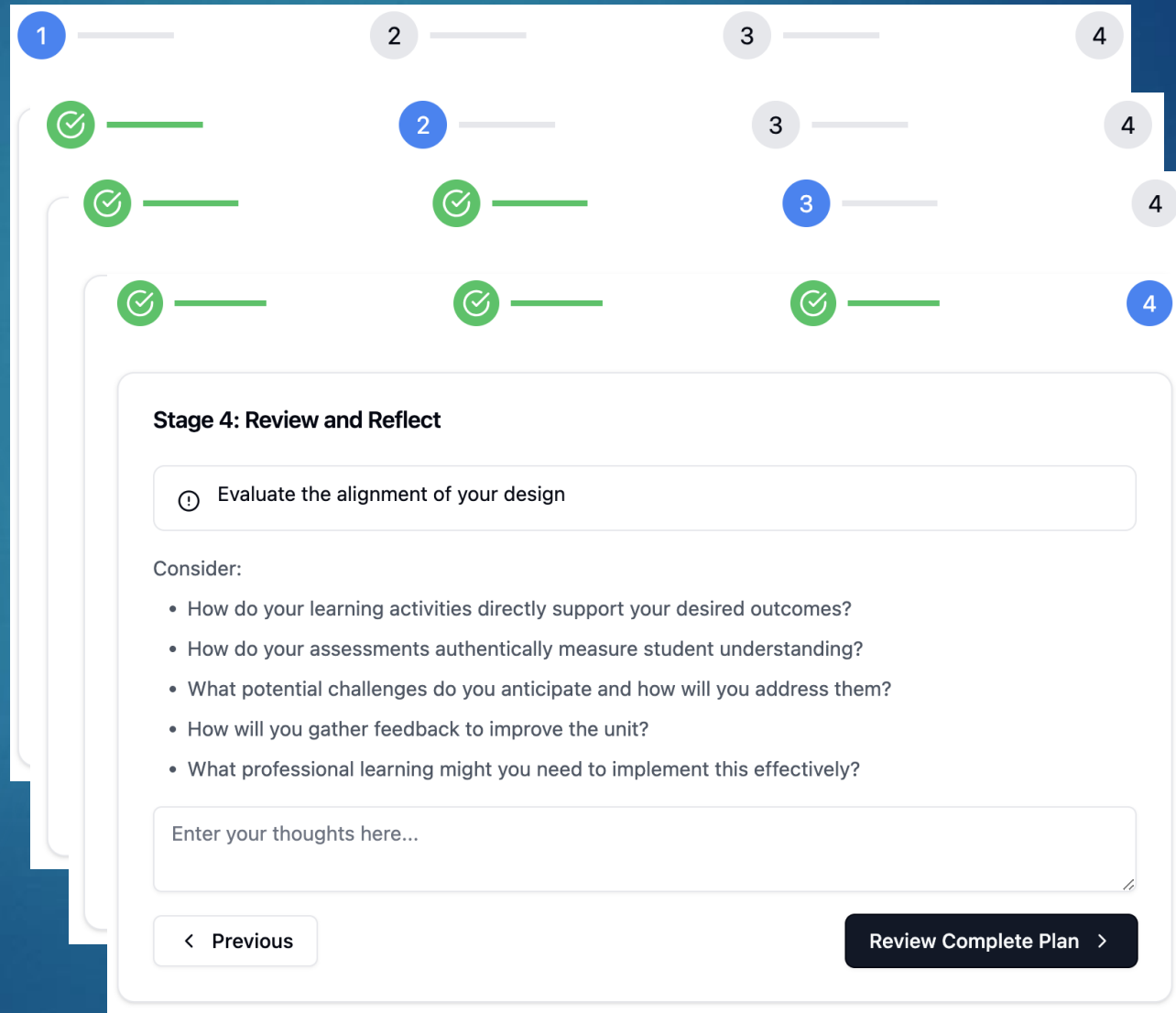
<https://claude.ai/chat/290791fe-149f-4754-b0f6-44ed17dad9f>

# AI as co-creator

## Learning type: Production

Learning through production is the way the teacher motivates the learner to consolidate what they have learned by articulating their current conceptual understanding and how they used it in practice

@ABC 



1 2 3 4

1 2 3 4

1 2 3 4

1 2 3 4

### Stage 4: Review and Reflect

① Evaluate the alignment of your design

Consider:

- How do your learning activities directly support your desired outcomes?
- How do your assessments authentically measure student understanding?
- What potential challenges do you anticipate and how will you address them?
- How will you gather feedback to improve the unit?
- What professional learning might you need to implement this effectively?

Enter your thoughts here...

< Previous

Review Complete Plan >

# The new hybrid: human + AI

- ▶ Prompt engineering: talking to AI
- ▶ Fine tuning: training AI
- ▶ TPACK to TP**AI**K: integrating AI
- ▶ Generat**iv**ism: collaborating with AI
- ▶ Intelligent communities: humans + AIs
- ▶ Agentic systems: creating autonomous AIs





# Assessing learning

COMPETENCIES FOR THE FUTURE

# UNESCO says re-design assessment

- ▶ “The long-term strategy is for institutions and educators to rethink the design of written assignments so that they are not used to assess tasks\* that GenAI tools can do better than human learners.
- ▶ Instead, they should address what humans can do that GenAI and other AI tools cannot do, including applying human values such as compassion and creativity\*\* to complex real-world challenges.”

- Guidance for generative AI in education and research, UNESCO, Sept 2023

\* **Assessment** as a set of tasks to be assessed will be disrupted by AI agents.

\*\***Creativity** as a uniquely human attribute is very much up for debate.

# Critical competencies for the AI age

## Human (?)

- ▶ Critical thinking
- ▶ Creativity\*
- ▶ Collaboration\*
- ▶ Leadership
- ▶ Resilience
- ▶ Problem-solving\*

## + AI

- ▶ **Literacy**: basic competencies
- ▶ Bias: understanding the issues
- ▶ Risk: levels of regulation
- ▶ Ethics: critical judgment
- ▶ **Teaching**: about, for + with AI
- ▶ **Research**: disciplinary practice

# Future skills are ~~digital~~ AI + human skills

- ▶ Human skills: critical thinking, creativity, collaboration, leadership, literacy
- ▶ AI skills: computational thinking, systems thinking, technical skills
- ▶ **Problem-based** learning requires real-world, problem-solving skills
- ▶ **Social learning** develops collaboration and teamwork skills
- ▶ **Performance-based** activities replicate professional practices
- ▶ **Skill-based** activities teach students future workplace skills
- ▶ **Peer-instruction** and feedback develops leadership skills
- ▶ **Digital/AI literacy** prepares students for the world

# PISA: generative assessment



- ▶ PISA: Programme for International Student Assessment
- ▶ Performative assessments: students will use AI chatbots to complete their work
- ▶ AI will also assess students' thinking skills to see how they approach learning and how they process information
- ▶ Generative/performative/dynamic assessment gauges content **intelligence** rather than fixed knowledge
- ▶ Long-term goal: "to create a new type of assessment that helps inform teaching and learning **in real time**"

# Embedding AI

THE NEXT PHASE IN DIGITAL TRANSFORMATION

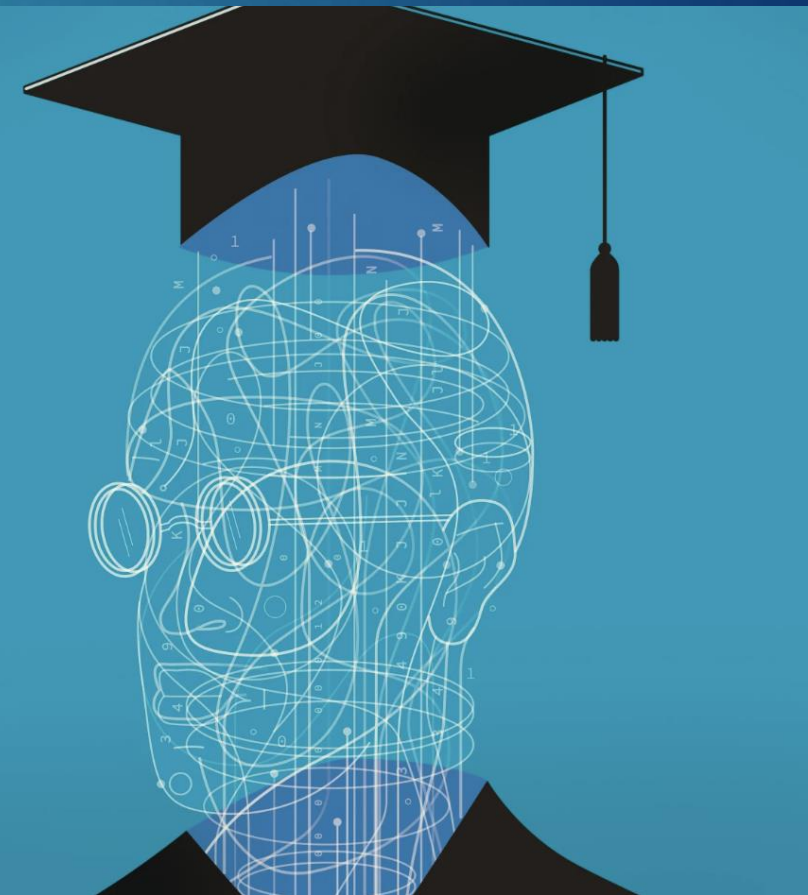
# AI enabled education means...

- ▶ **Learning agility** the flexibility to learn about AI and keep learning
- ▶ **Communities of practice** of innovators, testers and experimenters
- ▶ **Digital pedagogies** built on evidence-based practice and methods
- ▶ **Learning science** principles as the foundation for learning with AI
- ▶ **Active learning** using the Conversational Framework + dialogic learning
- ▶ **Intelligent communities** using the Community of Inquiry + peer learning
- ▶ **Dynamic assessment** using AI to scale authentic practices
- ▶ **Assessment of human + AI skills** connected to industry competencies
- ▶ **Omni-learning** new conceptions of learning spaces and places

# 2024

## The Future Is Hybrid

Colleges begin to reimagine learning  
in an AI world.







Thank-you!