

# CSEDU 2025

17<sup>TH</sup> INTERNATIONAL CONFERENCE ON COMPUTER SUPPORTED EDUCATION

PORTO, PORTUGAL

1 - 3 APRIL, 2025

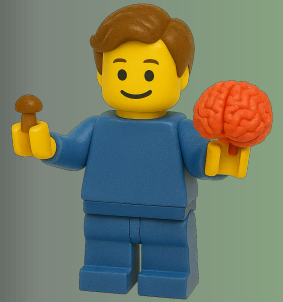
## Smaller and Smarter: Trends in Education

Carlos Delgado Kloos

Universidad Carlos III de Madrid

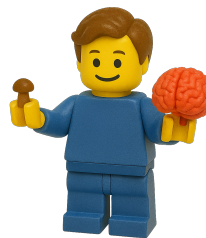
[educate.uc3m.es](http://educate.uc3m.es)

[it.uc3m.es/cdk](http://it.uc3m.es/cdk)



### Outline

- Smarter
- Smaller
- How can smart help small



2025-04-01--03 CSEDU OPO

C. Delgado Kloos, UC3M

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# CSEDU 2025

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## Smarter

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Chair Scalable Digital Education for All

**uc3m**

Universidad  
**Carlos III**  
de Madrid

## The Intelligence Age



- Sam Altman, [ia.samaltman.com](http://ia.samaltman.com)

### The Intelligence Age

September 23, 2024



Many of the jobs we do today would have looked like trifling wastes of time to people a few hundred years ago, but nobody is looking back at the past, wishing they were a lamplighter. If a lamplighter could see the world today, he would think the prosperity all around him was unimaginable. And if we could fast-forward a hundred years from today, the prosperity all around us would feel just as unimaginable.



Chair Scalable Digital Education for All

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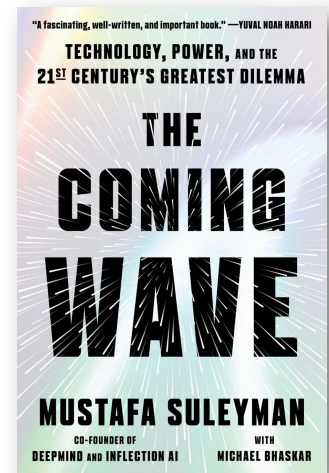
**uc3m**

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de Madrid

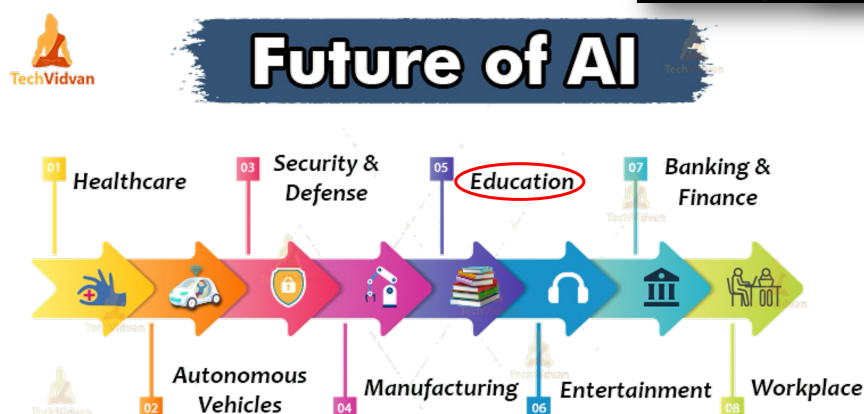
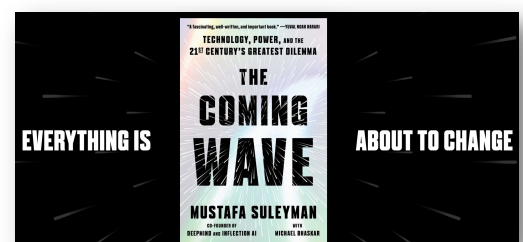


# Everything is about to Change

- Mustafa Suleyman: *The Coming Wave*
- [the-coming-wave.com](https://the-coming-wave.com)



# Everything is about to Change



# It All Started with a Chat Box

Envía un mensaje a ChatGPT



# Copilot, Assistant, Companion, Intern





# Writer, Copy Editor, Translator, Summarizer




## Text to Text: Summarizing Text




 **Tú**  
Make a summary of Dante's "Divine Comedy" in 2 paragraphs  
< 3 / 3 >

 **ChatGPT**  
Dante's "Divine Comedy" is an epic poem that takes readers on a journey through the realms of the afterlife, divided into three parts: Inferno (Hell), Purgatorio (Purgatory), and Paradiso (Heaven). The story begins with Dante, lost in a dark forest and encountering the ghost of the Roman poet Virgil, who becomes his guide. Together, they descend through the nine circles of Hell, where Dante witnesses the punishments of sinners, each fitting the nature of their sins. This vivid and often terrifying journey serves as a reflection on the consequences of human actions and the justice of divine retribution.

In the second part, Purgatorio, Dante and Virgil climb the mountain of Purgatory, where souls are purified before entering Heaven. Here, the atmosphere is more hopeful as souls undergo penance to atone for their sins. Finally, in Paradiso, Dante is guided by Beatrice, his ideal woman, through the nine spheres of Heaven. This part is a celebration of divine love and wisdom, culminating in Dante's direct encounter with God. Throughout the "Divine Comedy," Dante explores themes of sin, redemption, and the human quest for spiritual enlightenment, creating a timeless masterpiece that reflects the moral and philosophical concerns of his time.

 **Tú**  
Rewrite the above in simpler terms

 **ChatGPT**  
Dante's "Divine Comedy" is a long poem about a journey through the afterlife. It has three parts: Inferno (Hell), Purgatorio (Purgatory), and Paradiso (Heaven). It starts with Dante, the main character, lost in a dark forest. He meets the ghost of the poet Virgil, who helps him. Together, they travel through Hell, seeing the punishments for different sins. Each punishment matches the sin, showing how actions have consequences.

Next, in Purgatory, Dante and Virgil climb a mountain where souls work to purify themselves before going to Heaven. This part is more hopeful because the souls are improving themselves. Finally, in Heaven, Dante is guided by Beatrice, the woman he loves. They travel through different levels of Heaven, experiencing divine love and wisdom. At the end, Dante meets God. The whole poem talks about sin, redemption, and the search for spiritual understanding, reflecting the beliefs and ideas of Dante's time.

# Text to Text: Inferring

- Extraction of sentiment and emotions
- Topic extraction



Extract the sentiment and emotions



**Sentiment:** The sentiment of the original text is positive. It highlights the benefits and opportunities of open learning and e-learning, emphasizing accessibility and flexibility in education.

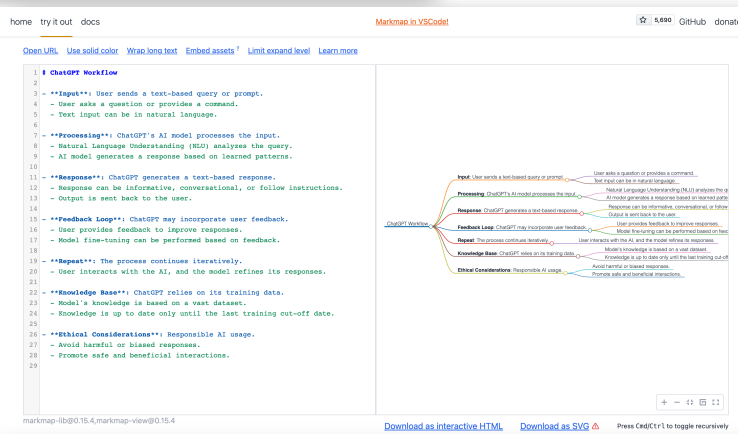
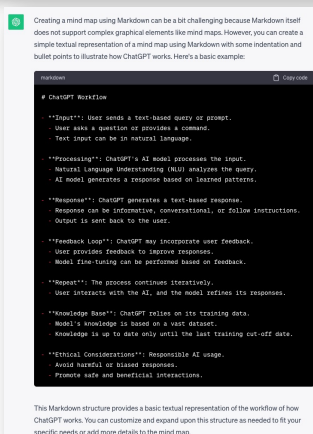
**Emotions:** The text conveys a sense of enthusiasm and optimism about the concepts being discussed. It portrays open learning and e-learning as empowering and transformative. The tone is informative and encouraging, promoting the idea that these approaches can provide education to a diverse range of learners.

# Structured Text: Mindmap in Markdown



Generate a markdown code for a mindmap that shows how chatGPT works

**markmap**  
markdown + mindmap

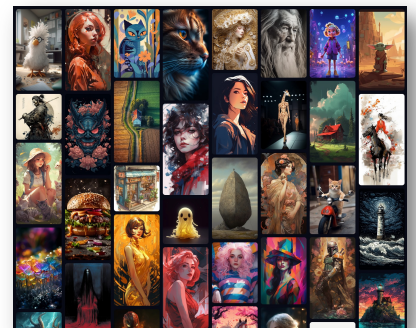


# Graphic Designer, Painter



## Text to Image

- Dall·e ([openai.com/product/dall-e-3](https://openai.com/product/dall-e-3))
- Midjourney ([midjourney.com](https://midjourney.com))
- Stable Diffusion ([stablediffusionweb.com](https://stablediffusionweb.com))
- Stockimg ([stockimg.ai](https://stockimg.ai))
- Letsenhance ([letsenhance.io](https://letsenhance.io))

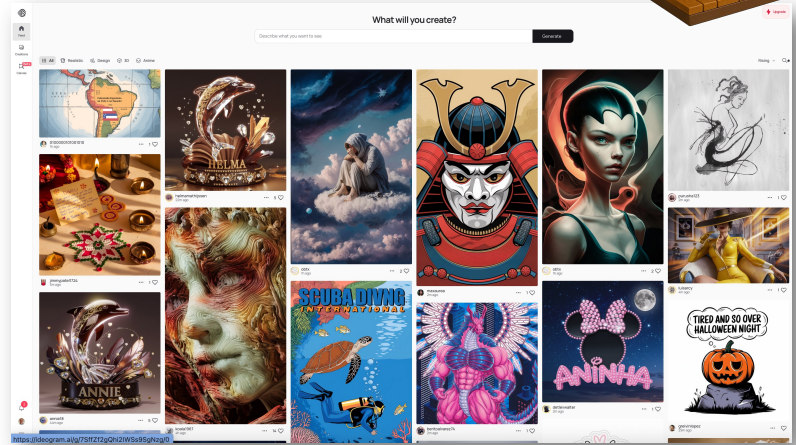




# Text to Image: Ideogram



- **ideogram.ai**
- Creates images with text, e.g. for logos



# Image to Image: Improving Images



- **magnific.ai**



  
improve  
resolution





# Image to Image: Extending Images



ex-  
tend



ex-  
tend



# Audio Specialist



# Text to Audio



- Music

- Suno



- Udio



- Podcasts

- NotebookLM



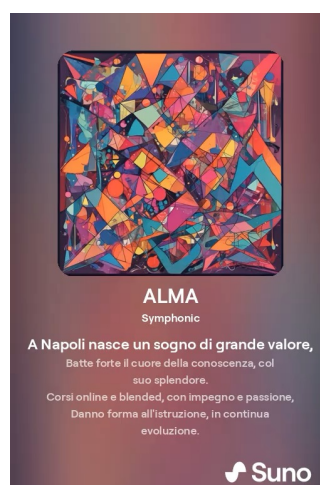
- Wondercraft



## Text to Audio: Suno



- **suno.com**

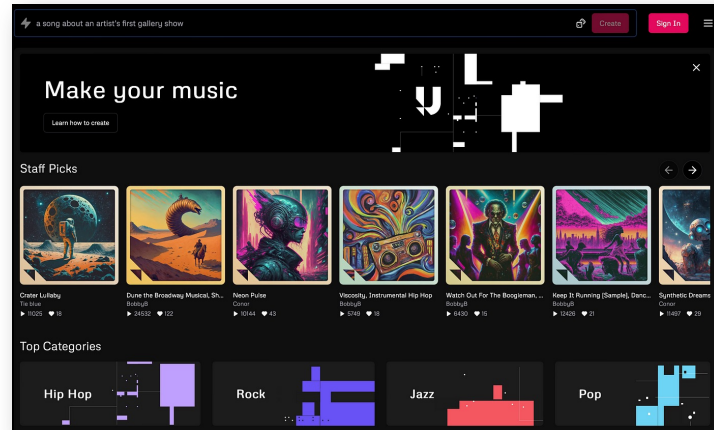


# Text to Audio: Udio

udio



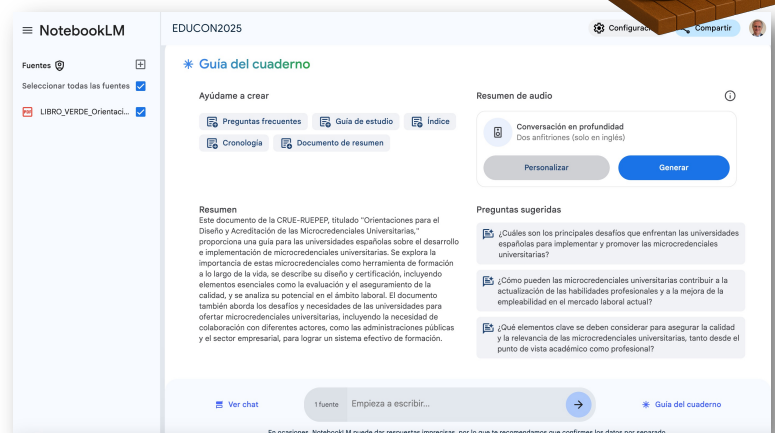
- **udio.com**



# Text to Audio: NotebookLM

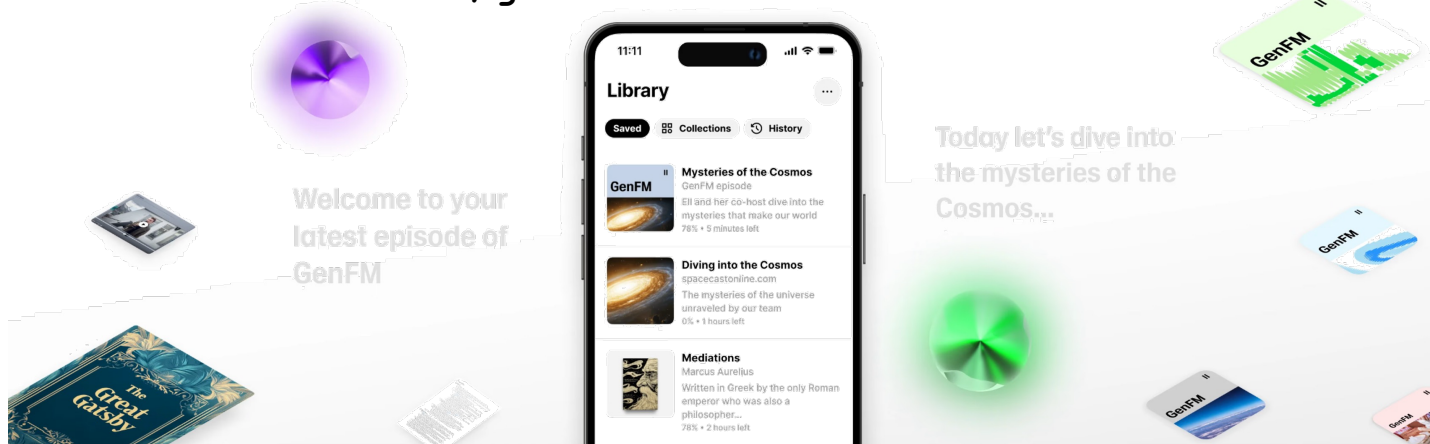


- **notebooklm.google**
- Upload your documents
  - Get a summary
  - Ask questions
  - Generate ideas
  - Create a podcast (personalizable)



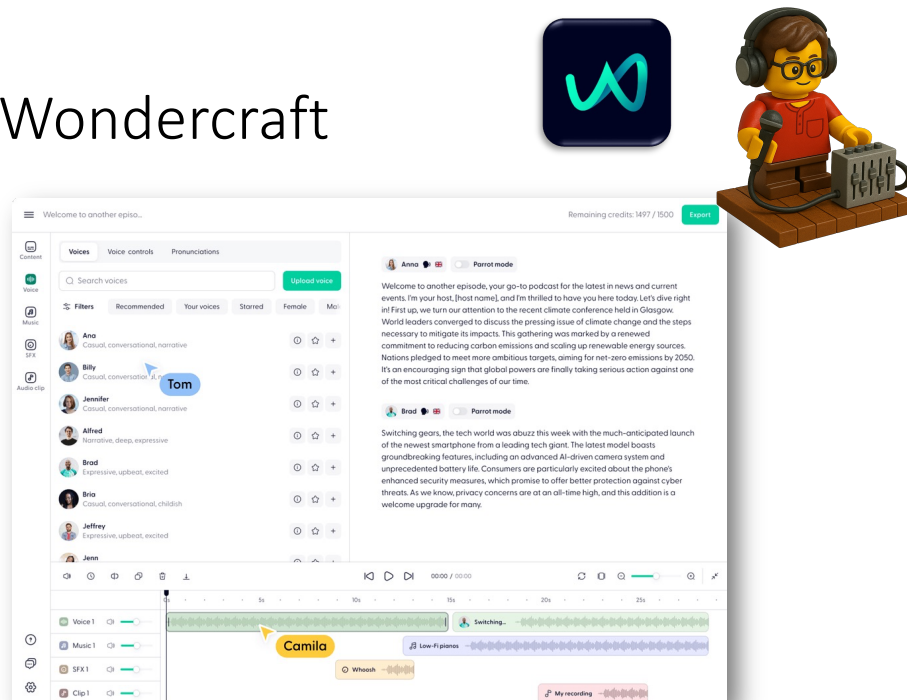
# Text to Audio: GenFM

- [elevenlabs.io/genfm](https://elevenlabs.io/genfm)



# Text to Audio: Wondercraft

- [wondercraft.ai](https://wondercraft.ai)

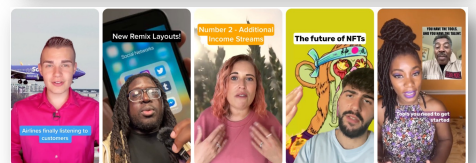
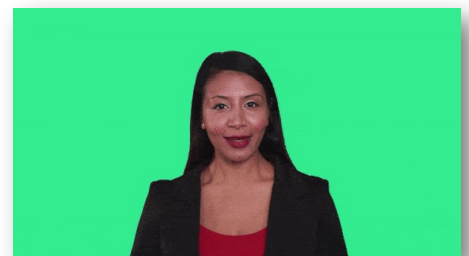


# Video Recorder



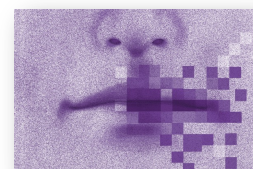
# Text to Video

- Synthesia ([synthesia.io](https://www.synthesia.io))
- Heygen ([heygen.com](https://www.heygen.com))
- D-ID ([d-id.com](https://www.d-id.com))
- Colossyan ([colossyan.com](https://www.colossyan.com))
- Invideo ([invideo.io](https://www.invideo.io))

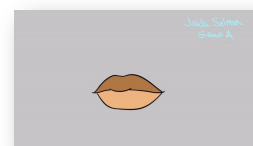




# Text to Video



Voice cloning



Lip sync

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[federica.eu/esplorare-ia](https://federica.eu/esplorare-ia)

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# Text to Video: Avatar



Bene, è davvero buona idea.

[federica.eu/esplorare-ia](https://federica.eu/esplorare-ia)

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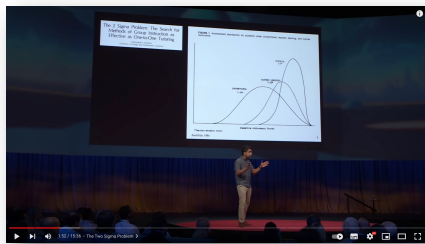


# Video to Text

**Merlin**



**merlin.foyer.work**



AI in education can be positive, with personal AI tutors and teaching assistants. It can improve student performance significantly.

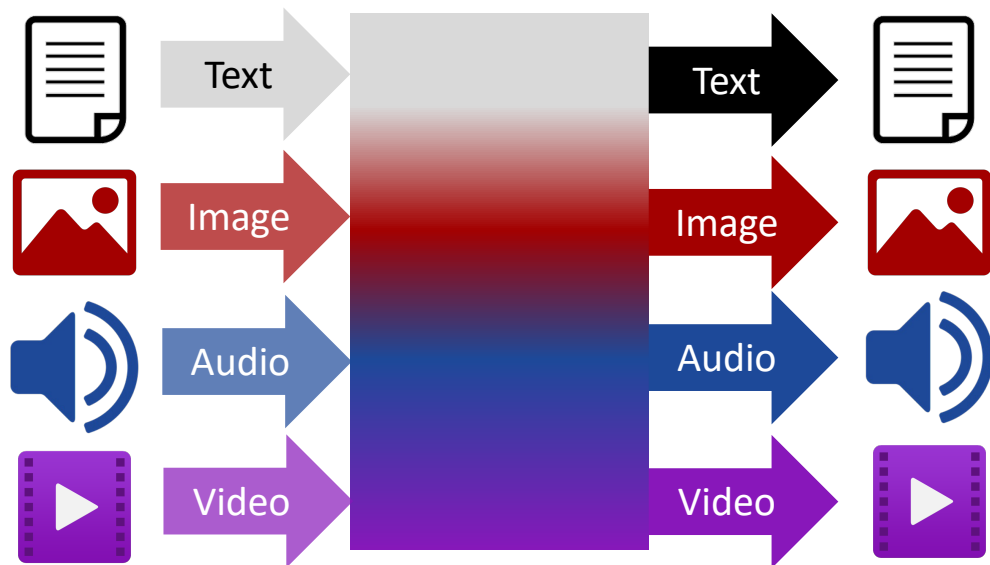
- ♦ AI could be the biggest positive transformation in education 00:04
- ♦ Khanmigo AI tutors students in math and coding exercises, identifying mistakes and misconceptions. 02:14
- ♦ Khanmigo can act as a super tutor and provide guidance counseling to every student 04:15
- ♦ Students can talk to historical figures through AI-powered conversation 06:08
- ♦ Khanmigo uses generative AI to enhance reading comprehension and writing skills 08:00
- ♦ AI-powered writing coach and teacher's guide on steroids 09:53
- ♦ GPT-4's ability in math and tutoring improved dramatically by allowing AI to think before speaking. 11:47
- ♦ Active participation is key in deciding the future of AI 13:38



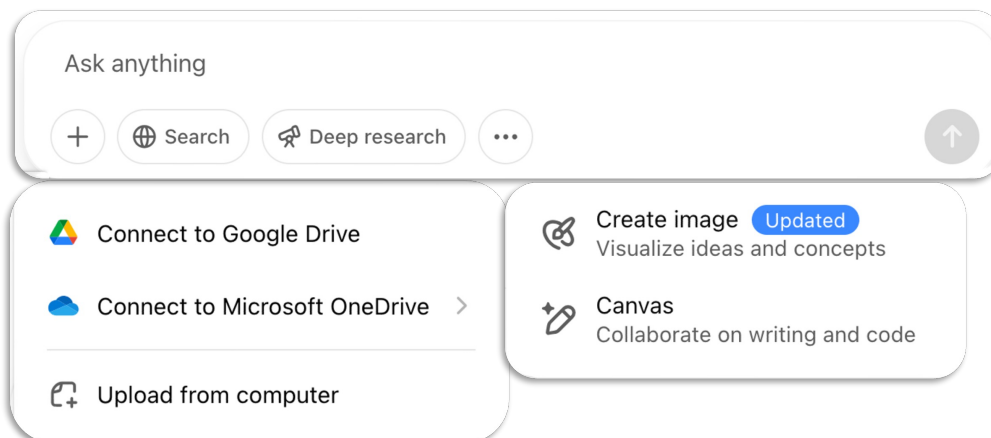
# All Together



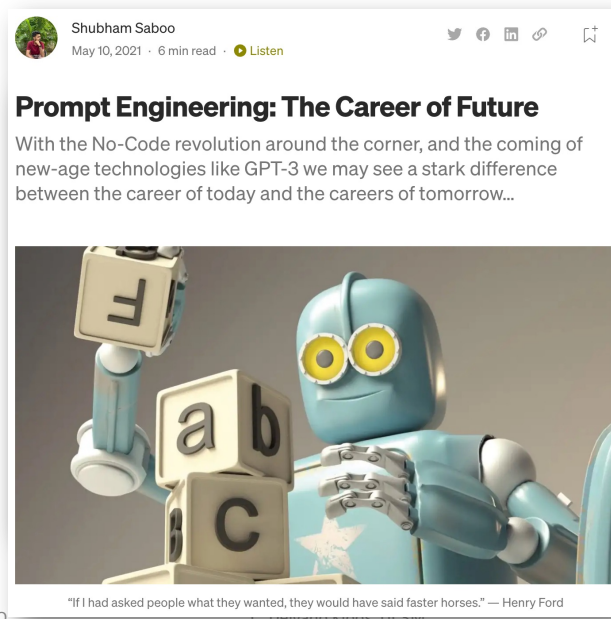
# Multimodal



# Improved Chat Box



# Importance of Prompting



## Chain of Thought (CoT) Prompting

### Chain-of-Thought Prompting Elicits Reasoning in Large Language Models

Jason Wei   Xuezhi Wang   Dale Schuurmans   Maarten Bosma  
Brian Ichter   Fei Xia   Ed H. Chi   Quoc V. Le   Denny Zhou

Google Research, Brain Team  
{jasonwei,dennyzhou}@google.com

[arxiv.org/abs/2201.11903](https://arxiv.org/abs/2201.11903)

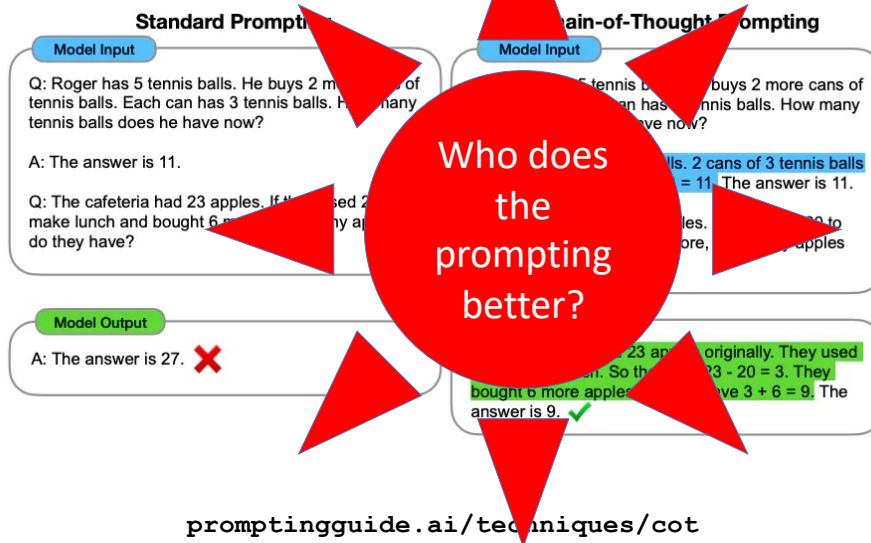
#### Abstract

We explore how generating a *chain of thought*—a series of intermediate reasoning steps—significantly improves the ability of large language models to perform complex reasoning. In particular, we show how such reasoning abilities emerge naturally in sufficiently large language models via a simple method called *chain-of-thought prompting*, where a few chain of thought demonstrations are provided as exemplars in prompting.

Experiments on three large language models show that chain-of-thought prompting improves performance on a range of arithmetic, commonsense, and symbolic reasoning tasks. The empirical gains can be striking. For instance, prompting a PaLM 540B with just eight chain-of-thought exemplars achieves state-of-the-art accuracy on the GSM8K benchmark of math word problems, surpassing even finetuned GPT-3 with a verifier.

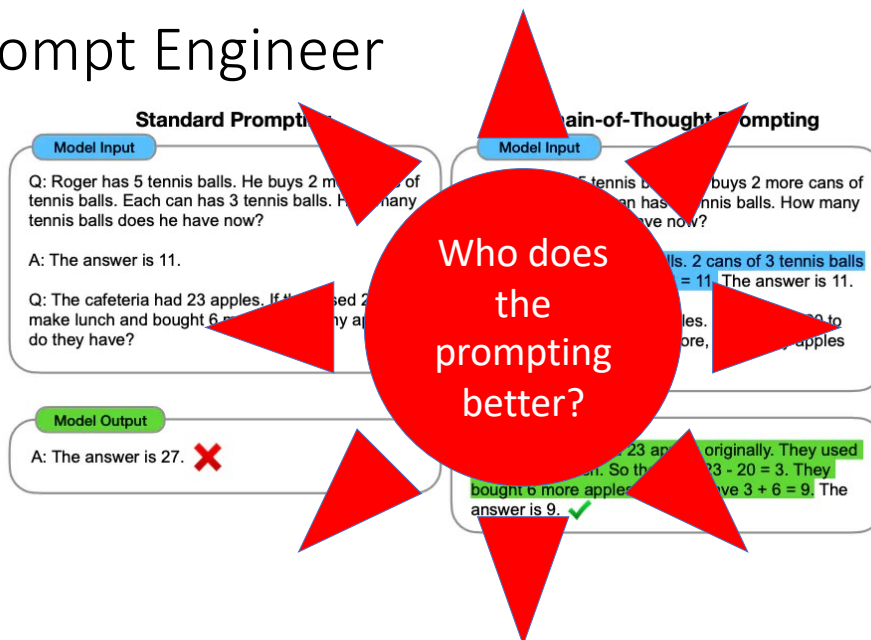
Emerging property,  
if the models are big enough!

# Chain of Thought (CoT) Prompting

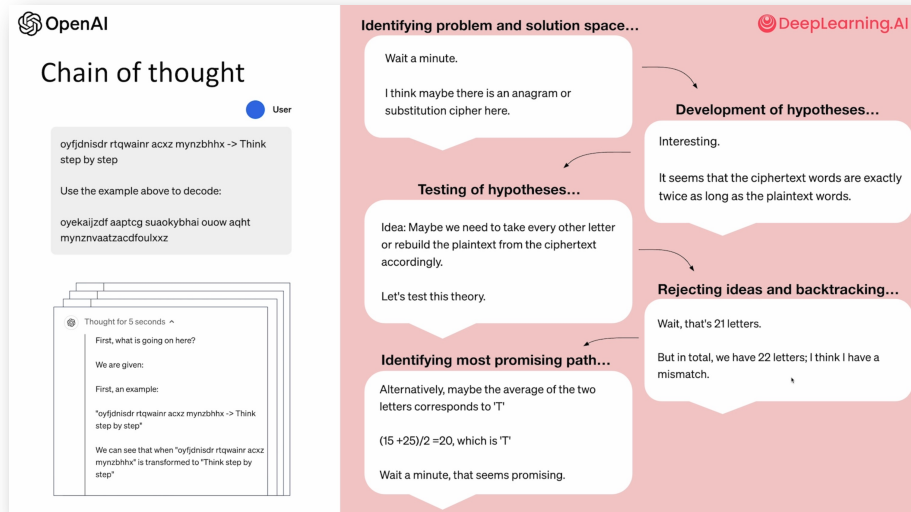


- Techniques
- Zero-shot Prompting
  - Few-shot Prompting
  - Chain-of-Thought Prompting
  - Self-Consistency
  - Generate Knowledge Prompting
  - Tree of Thoughts
  - Retrieval Augmented Generation
  - Automatic Reasoning and Tool-use
  - Automatic Prompt Engineer
  - Active-Prompt
  - Directional Stimulus Prompting
  - ReAct
  - Multimodal CoT
  - Graph Prompting

# Prompt Engineer



# Thinking

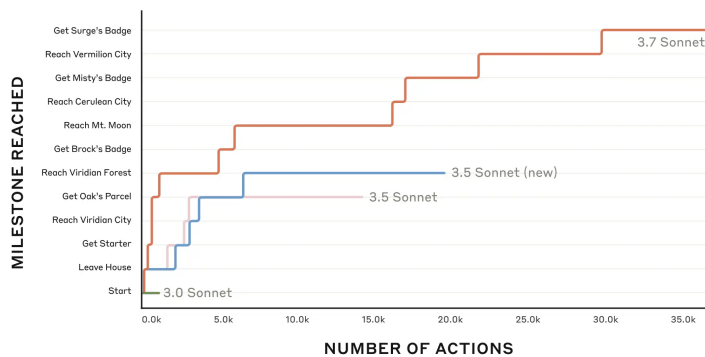


# Claude's Extended Thinking



## Claude models playing Pokémon\*

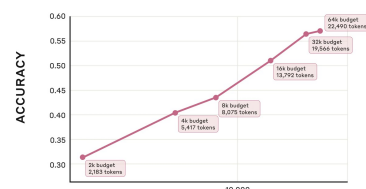
Milestone progress over time



\* Pokémon is a registered trademark of Nintendo of America Inc. This chart references Pokémon terminology solely to identify game milestones reached by Claude models. No affiliation, sponsorship, or endorsement by Nintendo of America Inc. is implied or intended.

## AIME 2024 performance

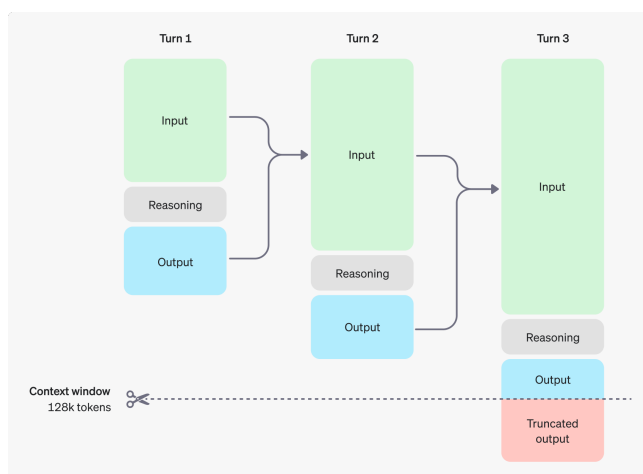
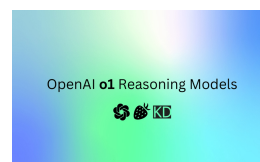
vs. actual thinking token usage



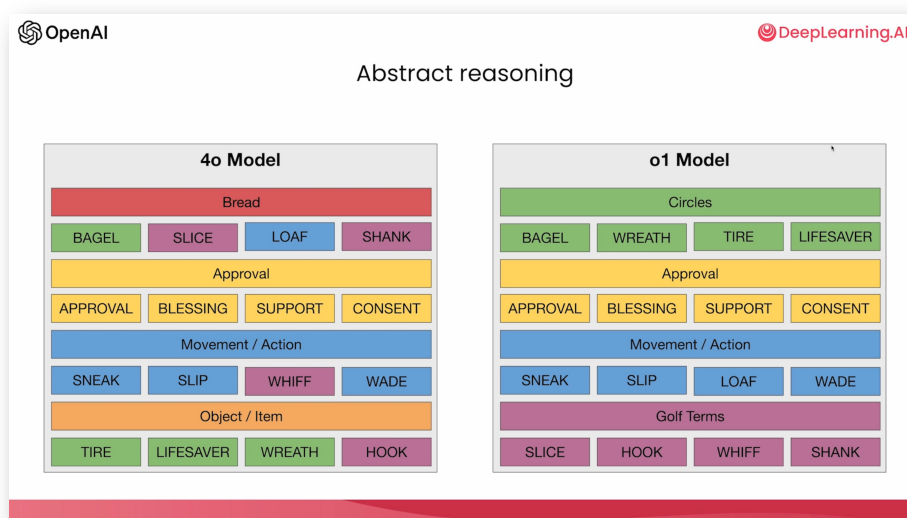
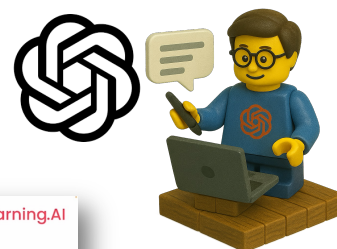
**AVG THINKING**  
Tokens used per problem (log scale)

[anthropic.com/research/visible-extended-thinking](https://anthropic.com/research/visible-extended-thinking)

# OpenAI Reasoning

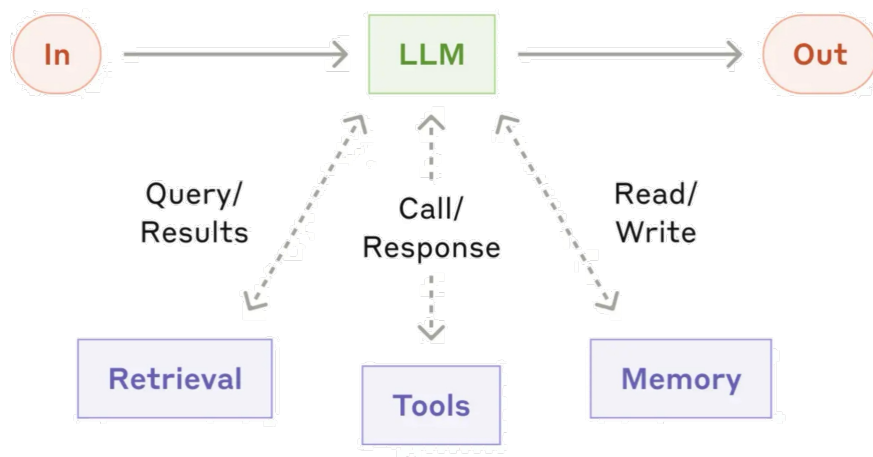


# Abstract Reasoning

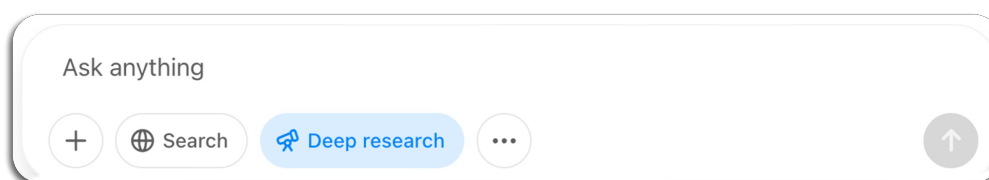




# Augmentations



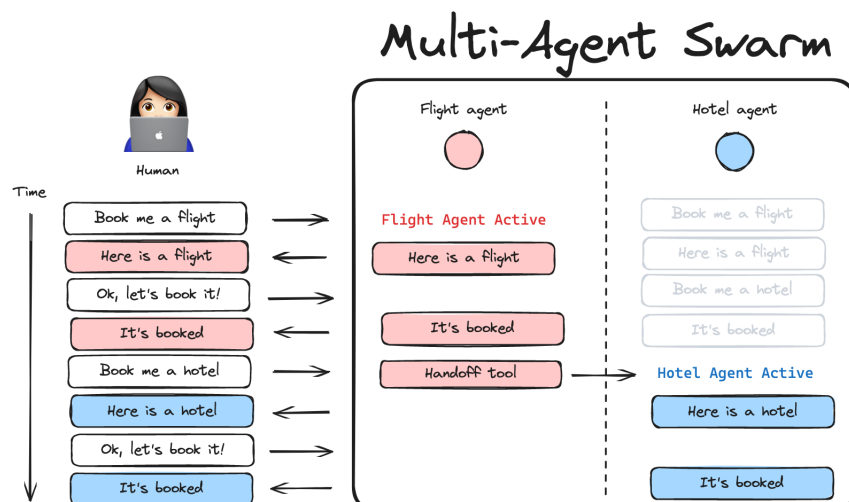
# Improved Chat Box



# All Collaborating



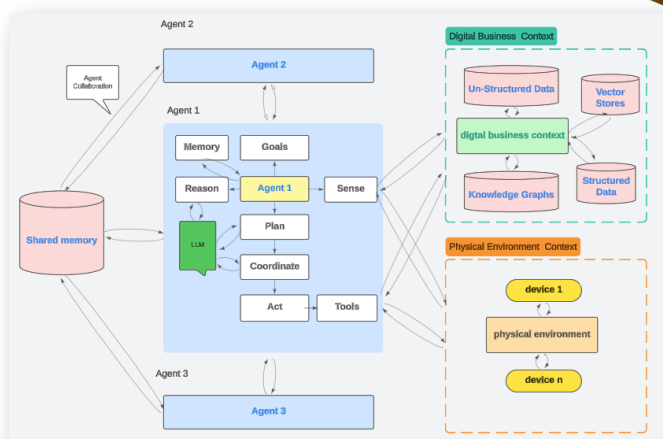
## Multi-Agent Systems



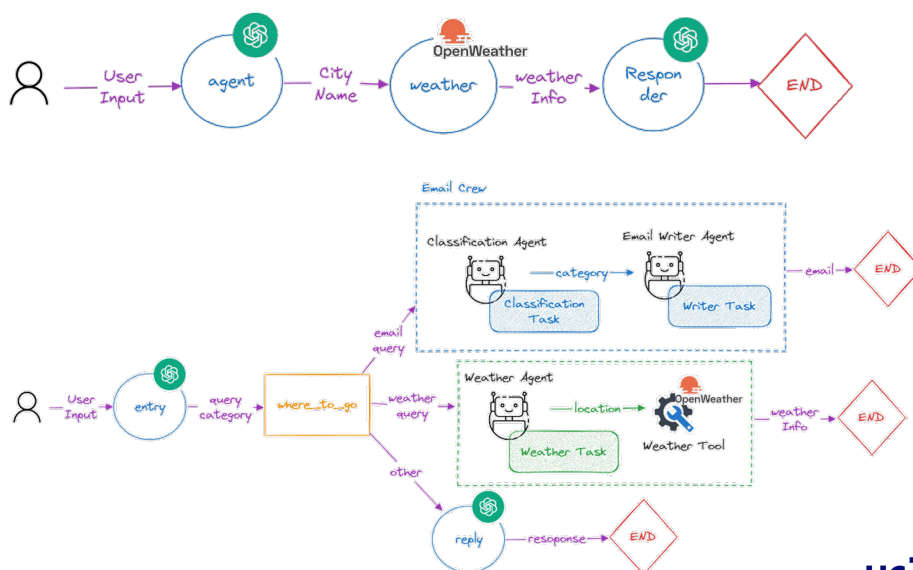
# Agentic Systems



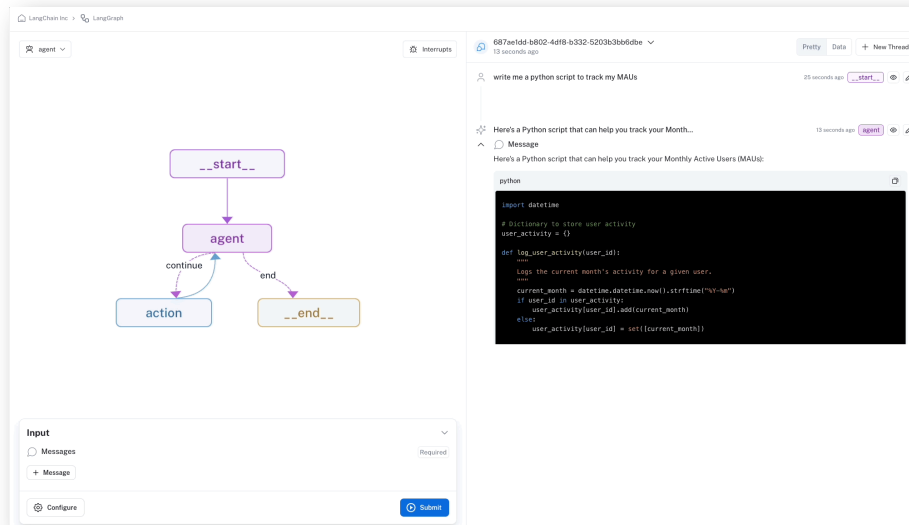
- Workflow
  - Sequential (chaining)
  - Conditional (routing)
  - Parallel (parallelization)
  - Loop (evaluator-optimizer)
- Autonomous



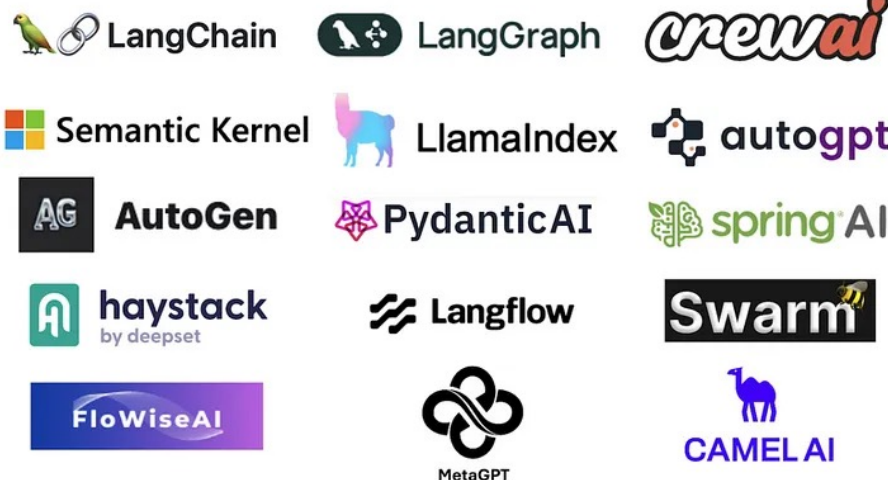
## LangChain: Workflow



# LangGraph Studio



## Agent Frameworks



# Our Role: Supervision, Judgement



## Critical Thinking

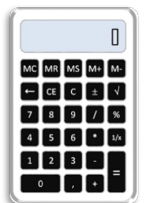
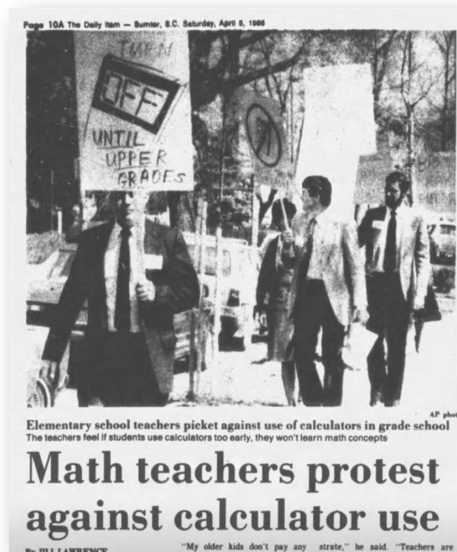
- What is Critical Thinking?
  - The objective **analysis and evaluation** of an issue in order to form a **judgement**
- How do you teach Critical Thinking?



# Critical Thinking for Navigation

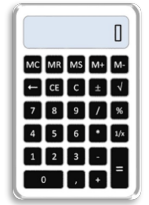


# Calculators



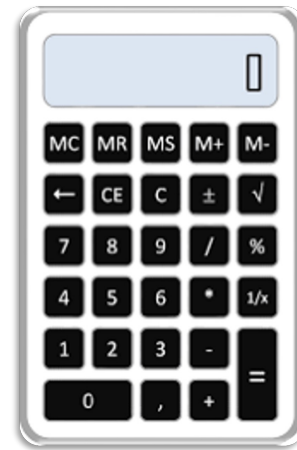


# What Should be Taught with Calculators?



*Multiplication Table Chart*

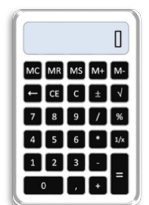
X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100



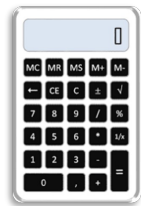
## Critical Thinking for Multiplication

How much is?

$$51.380 \times 8.736$$



# Critical Thinking for Multiplication

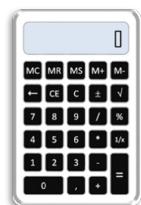


How much is?

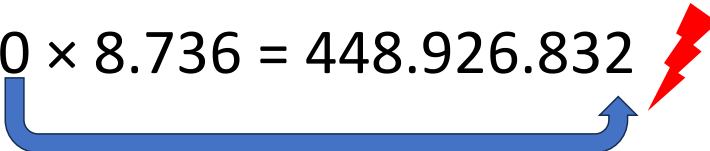
$$51.380 \times 8.736$$

$$\begin{array}{r} 308280 \\ 1541400 \\ 35966000 \\ \hline 411040000 \\ \hline 448855680 \end{array}$$

# Critical Thinking for Multiplication

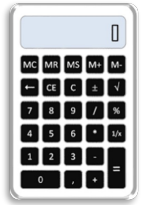


Is this correct?

$$51.380 \times 8.736 = 448.926.832$$


## Critical Thinking for Multiplication

Is this correct?

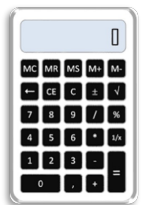


$$51.387 \times 8.736 = 448.926.832 \quad ?$$

Last digit

## Critical Thinking for Multiplication

Is this correct?

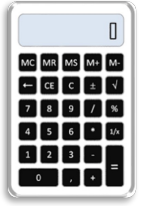


$$51.387 \times 8.736 = 448.926.832 \quad ?$$

Order of magnitude

## Critical Thinking for Multiplication

Is this correct?



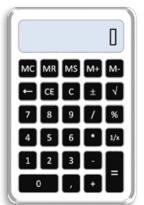
$$\cancel{51.387} \times 8.736 = 448.926.832$$

•

3

## Critical Thinking for Multiplication

Is this correct?

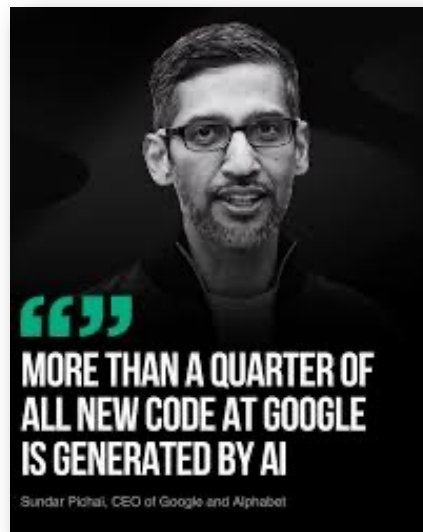


$$\cancel{51.387} \times 8.736 = \cancel{448.926.832}$$



Not multiple of 3 

# Coding with AI



# Coding

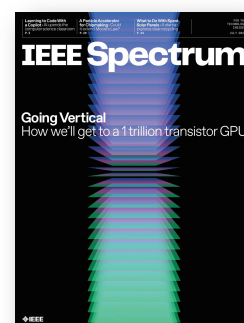
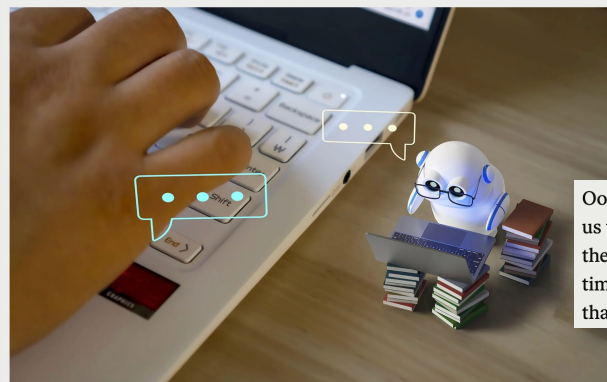


## AI Copilots Are Changing How Coding Is Taught >

Professors are shifting away from syntax and emphasizing higher-level skills

BY RINA DIANE CABALLER | 02 MAY 2024 | 4 MIN READ |

Rina Diane Caballer is a Contributing Editor covering tech and its intersections with science, society, and the environment.



**IEEE Spectrum** FOR THE TECHNOLOGY INSIDER

July 2024 Issue

Ooi echoes that sentiment, noting that generative AI tools “will free up time for us to teach higher-level thinking—for example, how to design software, what is the right problem to solve, and what are the solutions. Students can spend more time on optimization, ethical issues, and the user-friendliness of a system rather than focusing on the syntax of the code.”



# Need for Programmers



The screenshot shows the U.S. Bureau of Labor Statistics website. The main heading is "OCCUPATIONAL OUTLOOK HANDBOOK". Below it, the section is "Computer Programmers". The "Job Outlook" section states: "Employment of computer programmers is projected to decline 10 percent from 2023 to 2033." This phrase is circled in red. Other sections visible include "Pay" (median annual wage of \$99,700 in May 2023) and "What They Do".

# Cursor



The screenshot shows the Cursor AI Code Editor website. The main heading is "The AI Code Editor". Below it, the text says "Built to make you extraordinarily productive, Cursor is the best way to code with AI." There are buttons for "DOWNLOAD FOR MACOS" and "ALL DOWNLOADS". A code editor interface is shown at the bottom, displaying code for a "TransportStack" and a "CHAT" panel on the right.

cursor.com

# Cursor



## Agent

Cursor's agent mode can complete tasks end to end. It does this quickly, while keeping programmers in the loop. Try it out by selecting 'agent' in Composer.

## Tab

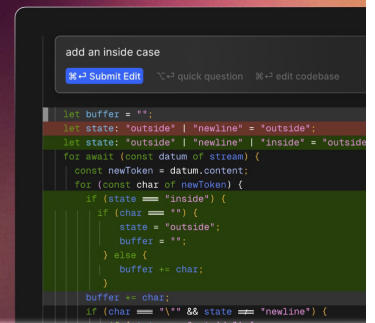
Cursor includes a powerful autocomplete that predicts your next edit. Once enabled, it is always on and will suggest edits to your code across multiple lines, taking into account your recent changes.

## Chat

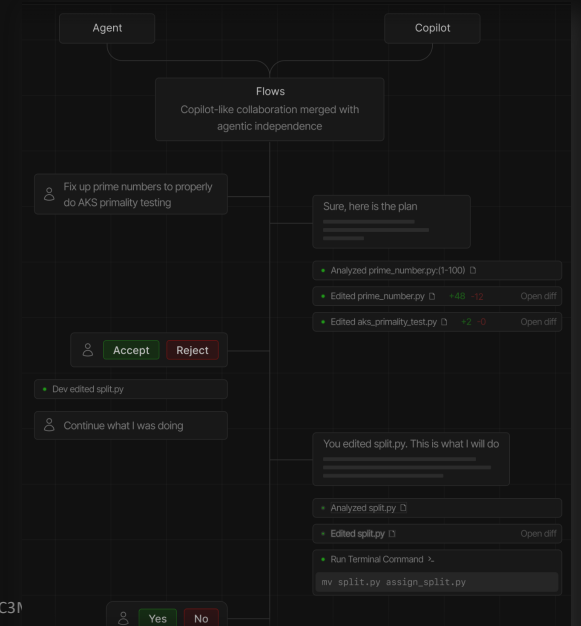
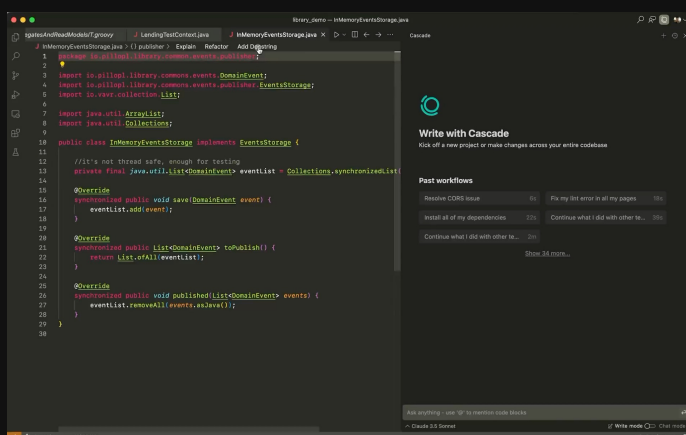
Chat lets you talk with an AI that sees your codebase. The chat can always see your current file and cursor, so you can ask it things like: "Is there a bug here?". You can add particular blocks of code to the context with `⌘+Shift+L` or `@`. You can chat with your entire codebase with `⌘+Enter`.

## ⌘ K

⌘ K lets you edit and write code with the AI. To edit, try selecting some code, click "Edit," and describe how the code should be changed. To generate completely new code, just type ⌘ K without selecting anything.



# Windsurf



# Critical Thinking for Coding: Vibe Coding

Peter Wong ◦ Constellar.ai



Andrej Karpathy

## The Ultimate Guide to Vibe Coding

### What is Vibe Coding?

- A new paradigm where you "fully give in to the vibes" (Andrej Karpathy)
- **Embrace AI to write 95%+ of your codebase**
- Shift from being a programmer to being a "product engineer"
- Make 10-100x productivity gains by leaning into AI coding tools

### Essential Tools

1. **Cursor** - Most popular IDE for vibe coding with comprehensive code understanding
2. **Windsurf** - Fast-growing alternative that indexes your entire codebase
3. **Claude 3.5 Sonnet/3 Opus** - Top models for everyday coding tasks
4. **Claude 01/03** - Reasoning models for debugging complex issues
5. **ChatGPT** - Used specifically for reasoning through debugging problems

### The New Workflow

- **Roll not fix** - Rewriting is cheaper than debugging (just retry from scratch)
- Prompt in parallel (run multiple AI sessions on different features simultaneously)
- Focus on rapid iteration rather than perfect code
- **Human taste is now more important than coding skill**

### When Vibe Coding Excels

- Zero-to-one product development (speed is everything)
- Feature prototyping and rapid iteration
- Projects where scale isn't an immediate concern
- **Simple to moderately complex applications**
- When working with modern, well-documented frameworks

### The Human Element

- **Develop system thinking and architecture skills** (AI still struggles here)
- Cultivate product taste and user empathy
- Learn to judge the quality of AI-generated code
- Debugging remains a critical human skill
- Focus on the "why" and "what" rather than the "how"

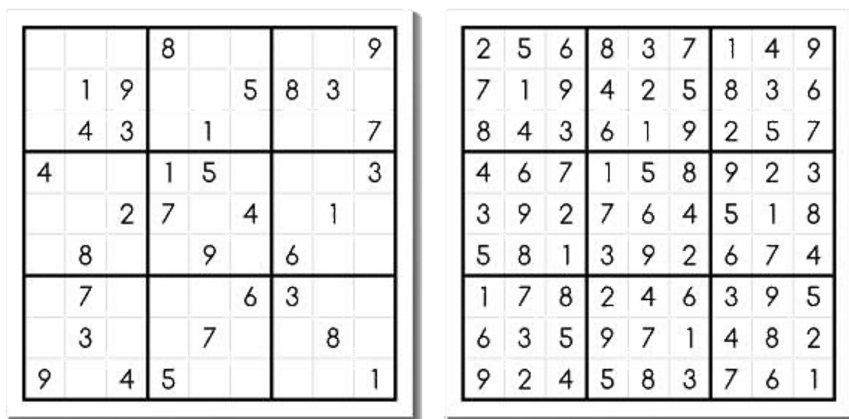
### Building for Scale

- Vibe coding gets you to MVP quickly, but scaling requires expertise
- Hire systems thinkers for complex infrastructure challenges
- **Technical debt accumulates faster - plan refactoring strategically**
- Critical systems may require more traditional approaches
- Balance quick development with architectural considerations

@peterwong\_xyz

## Change of Paradigm: From Solving to Checking

**P=NP?**



# Critical Thinking is Like Software Testing



## CSEDU 2025

17<sup>TH</sup> INTERNATIONAL CONFERENCE ON COMPUTER SUPPORTED EDUCATION

PORTO, PORTUGAL

1 - 3 APRIL, 2025

## Smaller

**Carlos Delgado Kloos**

Universidad Carlos III de Madrid

[educate.uc3m.es](mailto:educate.uc3m.es)

[it.uc3m.es/cdk](mailto:it.uc3m.es/cdk)

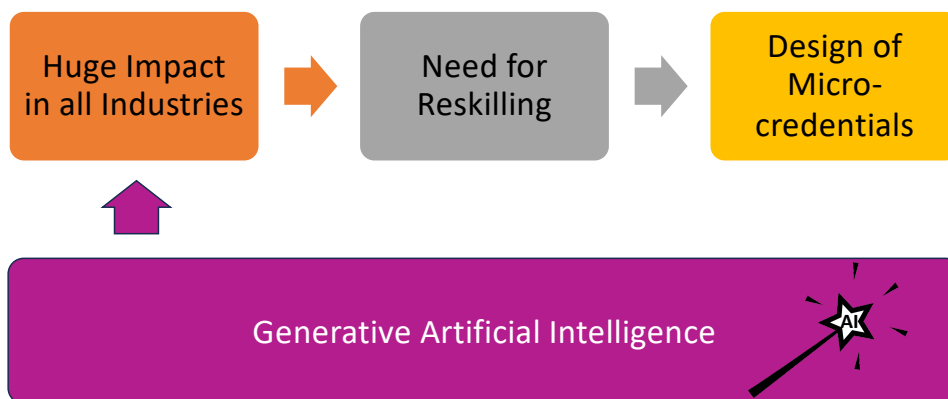
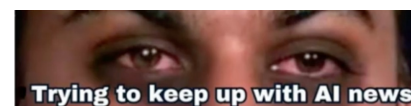




## Fast Pace of Change



## Fast Pace of Change





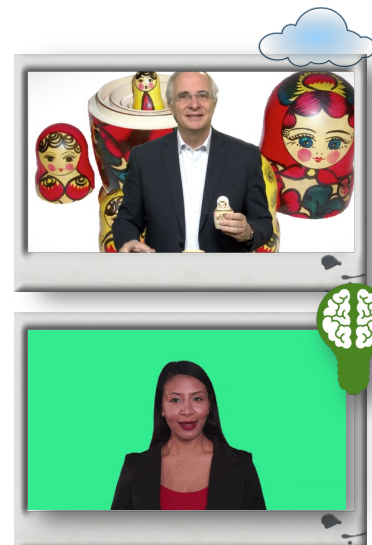
# Industrial-Style Education



# Out of Industrial-Style Education

Digital&AI technologies affect all industries

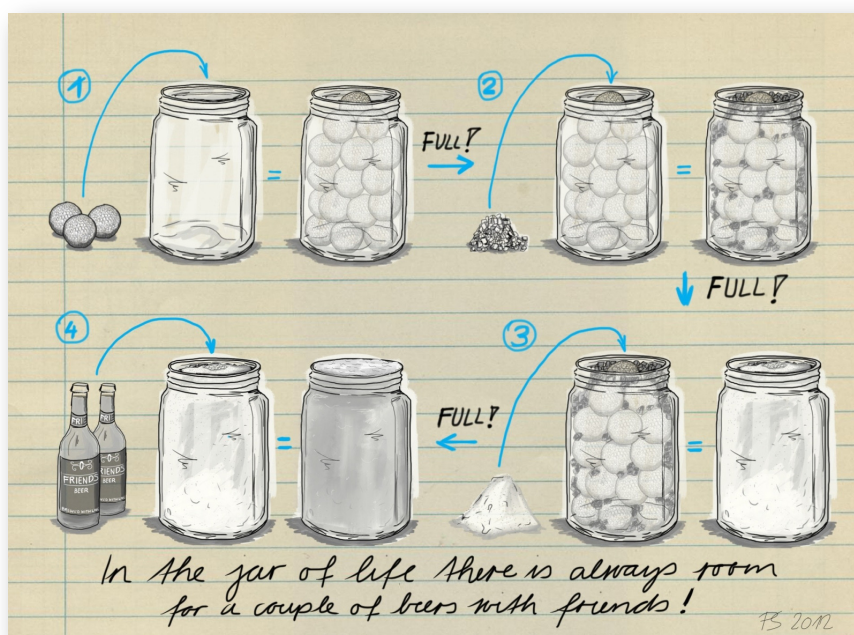
- Need to re-/up-skill
- Impossible to start a new degree
- Shorter programs needed: micro-credentials





# You Can Fit in More!

The flexibility of  
digital technology  
allows content to  
become smaller

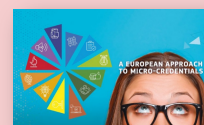


[balancedaction.me/2012/10/17/the-jar-of-life-first-things-first/](https://balancedaction.me/2012/10/17/the-jar-of-life-first-things-first/)



## Degrees

- **Just-in-case learning**
- Harmonized length in Europe
- Goal: fundamentals
- Students with known knowledge
- Slow change of offers
- Complex updating process
- Rigid teaching assignment
- Disciplinarity
- Paper certification
- Quality assurance by program



## Microcredentials

- **Just-in-time learning**
- Length not harmonized in Europe
- Goal: re-/up-skill
- Students with basic but diverse knowledge
- Fast demand-driven offering
- Fast updating
- Agile and flexible teaching assignment
- Multidisciplinarity
- Digital certification
- Impossible to assure quality for each microcredential

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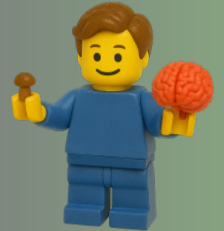
## Smarter for Smaller

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[educate.uc3m.es](http://educate.uc3m.es)

[it.uc3m.es/cdk](http://it.uc3m.es/cdk)



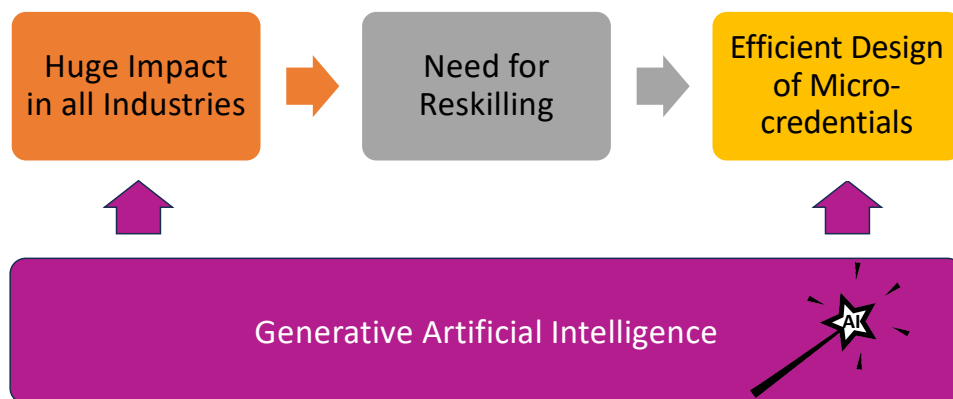
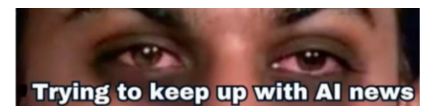
unesco

Chair Scalable Digital Education for All

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## Fast Pace of Change



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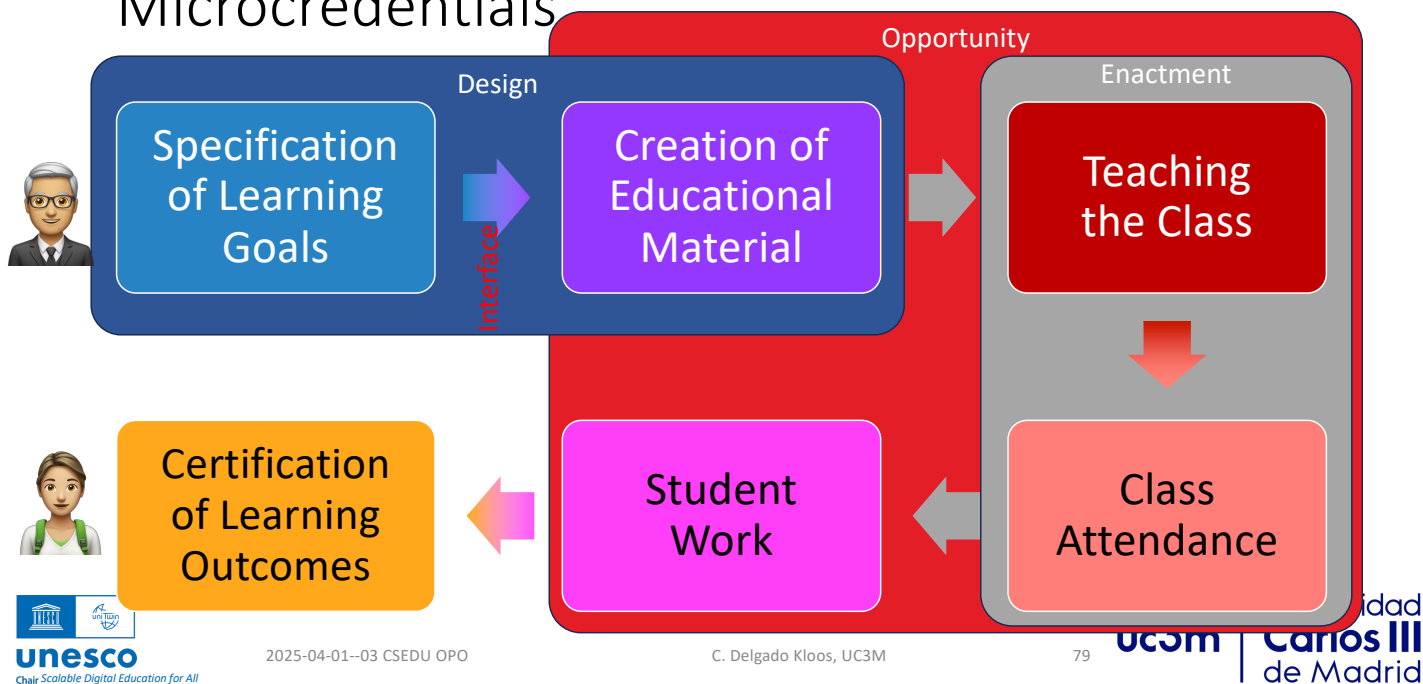
C. Delgado Kloos, UC3M

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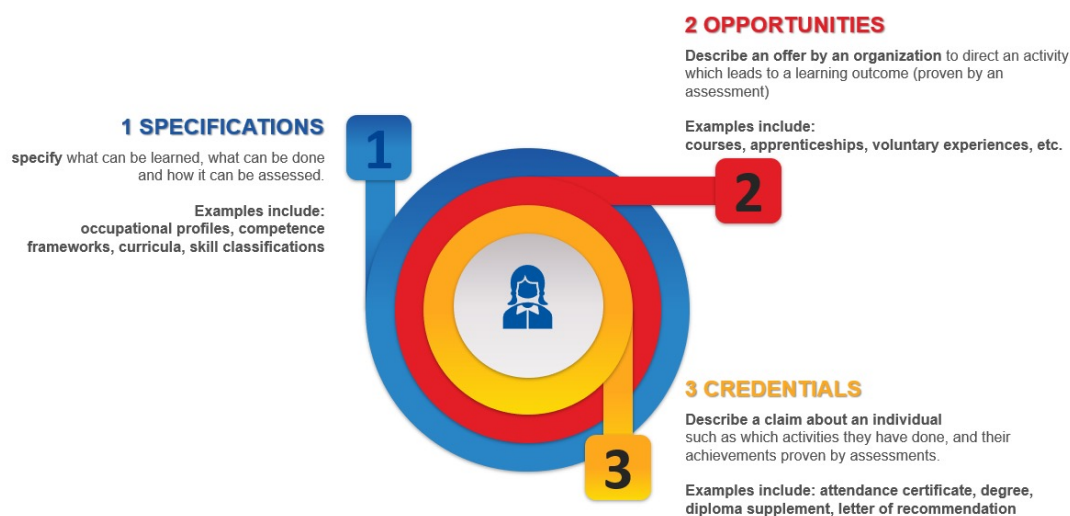
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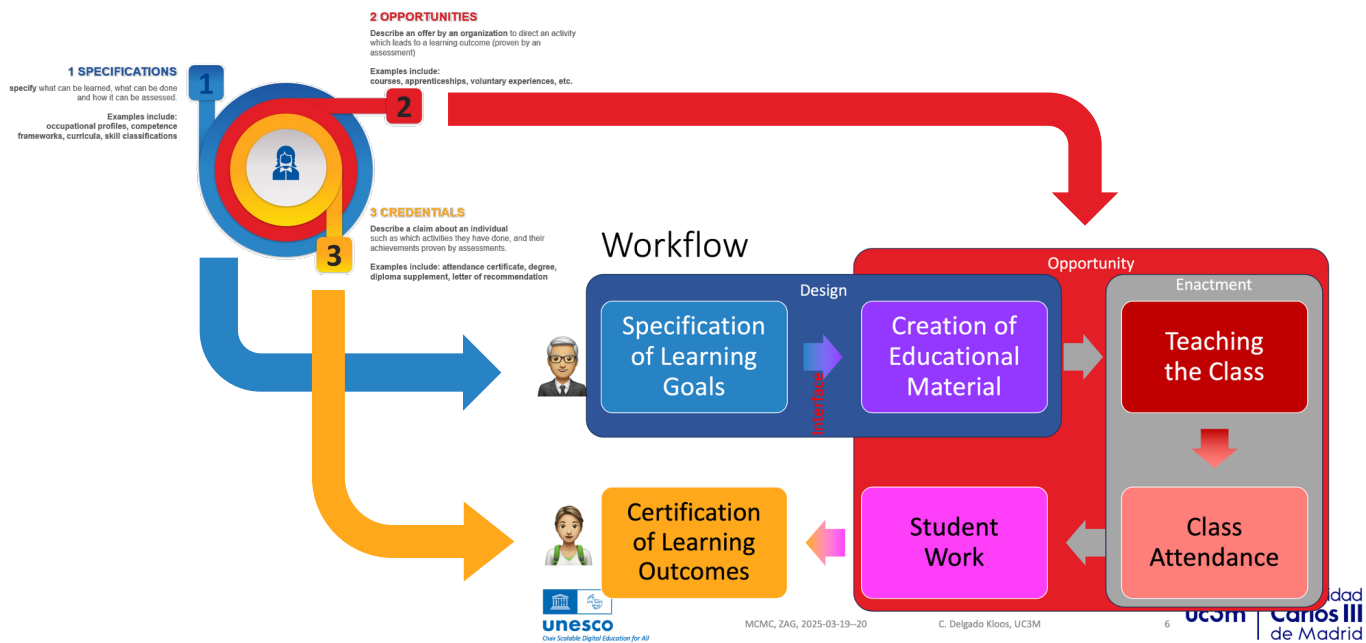
# Microcredentials



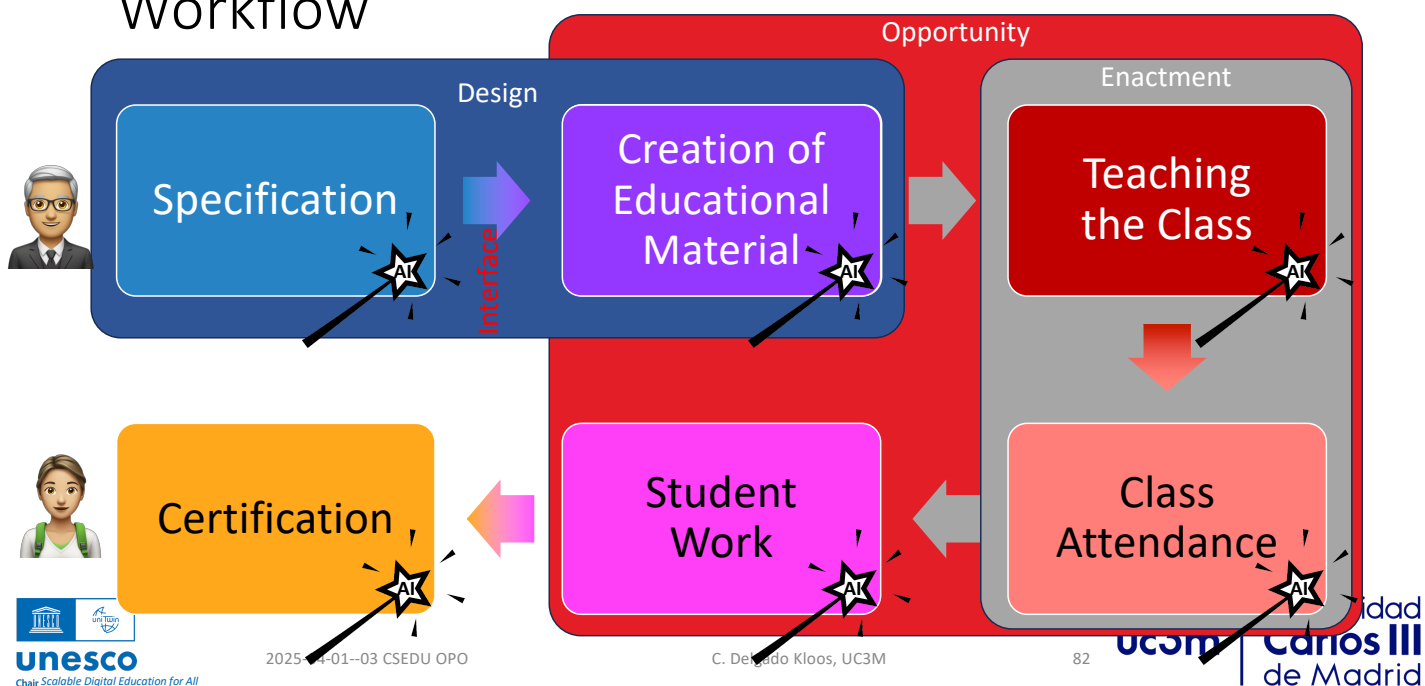
## Specifications, Opportunities, Credentials



[europass.europa.eu/en/node/2128](https://europass.europa.eu/en/node/2128)

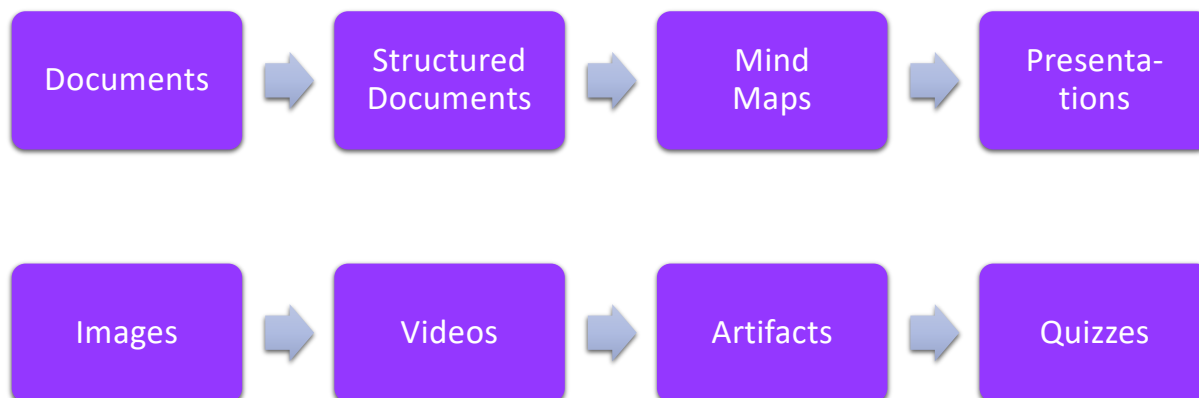


## Workflow

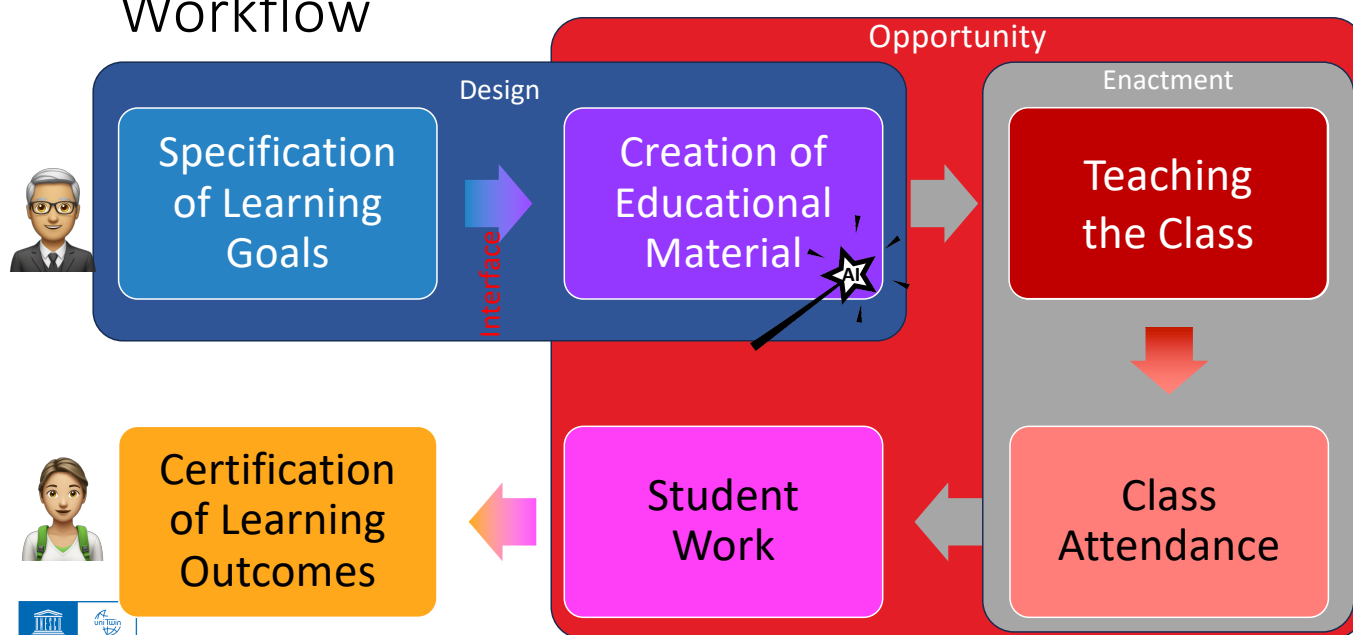


# Creation of Educational Material

Creation of Educational Material



# Workflow



# Teaching the Class

Teaching  
the Class



# Teaching Methods

Teaching  
the Class



**You**

Please suggest 3 teaching methods to teach recursion in the context of a Java programming course

## ChatGPT

Teaching recursion in a Java programming course can be challenging, but it's an important concept for students to understand. Here are three effective teaching methods:

### 1. Visualizations and Analogies:

- **Tree Diagrams:** Recursion often involves a tree-like structure. Use visualizations such as tree diagrams to represent the recursive calls and how they lead to smaller subproblems.
- **Mathematical Induction Analogy:** Draw parallels between recursion and mathematical induction. Show how solving a base case and assuming the solution for a smaller case can lead to the solution of a larger problem.
- **Stack Frames Analogy:** Explain the concept of stack frames in the context of method calls. Each recursive call creates a new stack frame, and the process continues until the base case is reached.

### 2. Interactive Examples:

- **Live Coding Sessions:** Perform live coding sessions to demonstrate recursive algorithms. Write code incrementally, showing how each recursive call contributes to solving the problem.
- **Trace Tables:** Create trace tables to help students visualize the state of variables and method calls at each step of the recursion. This can aid in understanding the flow of execution.
- **Debugging Exercises:** Provide students with deliberately flawed recursive code and ask them to debug it. This hands-on approach allows them to understand common pitfalls and strengthens their problem-solving skills.

### 3. Problem-Solving Exercises:

- **Progressive Problem Sets:** Design a set of programming exercises with increasing levels of complexity, starting from simple base cases to more intricate recursive solutions. This gradual progression helps students build confidence.
- **Real-World Examples:** Show real-world examples where recursion is a natural and efficient solution. For example, parsing and processing hierarchical data structures like XML or JSON can be a practical application of recursion.
- **Collaborative Problem Solving:** Encourage group work on recursive problem-solving exercises. Collaboration allows students to share insights and learn from each other's approaches. It also promotes a deeper understanding of the recursive thought process.

By combining these teaching methods, you can cater to different learning styles and help students grasp the concept of recursion in Java more effectively. Remember to provide ample opportunities for practice and encourage students to apply recursion in various programming scenarios.



# Class Orchestration

## Teaching the Class



**You**

Please generate a script to orchestrate a 50 minute class session to teach recursion in a Java programming class. Include collaborative tasks.



ChatGPT

### Class Session Plan: Teaching Recursion in Java (50 minutes)

Note: Adjust the timing based on the pace of your class and the level of familiarity your students have with recursion.

#### Objective:

- Understand the concept of recursion in Java.
- Learn to design and implement recursive algorithms.
- Apply recursion to solve programming problems.

#### Materials:

- Whiteboard and markers
- Projector for code demonstrations
- Laptops or computers for students
- Collaborative problem-solving handouts

#### Class Structure:

##### 1. Introduction (5 minutes)

- Briefly review the concept of methods/functions in Java.
- Introduce the concept of recursion and its relevance in programming.
- Explain the basics: a method calling itself, base case, and recursive case.

##### 2. Visualizing Recursion (10 minutes)

- Use a whiteboard or projector to draw a simple recursive tree diagram for a common problem (e.g., factorial, Fibonacci).
- Discuss the tree structure and how it relates to recursive calls.
- Introduce the concept of a base case and demonstrate its importance in preventing infinite recursion.

##### 3. Live Coding Session (15 minutes)

- Perform a live coding session to implement a simple recursive algorithm (e.g., factorial, Fibonacci) on the projector.
- Explain each step, emphasizing the recursive calls and how they contribute to solving the problem.
- Encourage students to ask questions during the coding session.

##### 4. Interactive Example and Tracing (10 minutes)

- Distribute a handout with a partially completed recursive code and a trace table.
- In pairs, students complete the code and trace the execution on the table.
- Discuss the solutions as a class, focusing on understanding the recursive flow.

##### 5. Collaborative Problem-Solving (5 minutes)

- Divide the class into small groups.
- Assign a more challenging recursive problem to each group (e.g., recursive tree traversal).
- Each group collaboratively designs and implements a recursive solution.
- Encourage groups to discuss and solve challenges together.

##### 6. Group Presentations and Discussion (5 minutes)

- Each group presents its solution to the class.
- Discuss different approaches, optimizations, and potential pitfalls.
- Encourage questions and feedback from the class.

##### 7. Conclusion and Assignment (5 minutes)

- Summarize key points about recursion in Java.
- Assign a homework exercise involving recursion for further practice.
- Emphasize the importance of applying recursion to solve real-world programming problems.

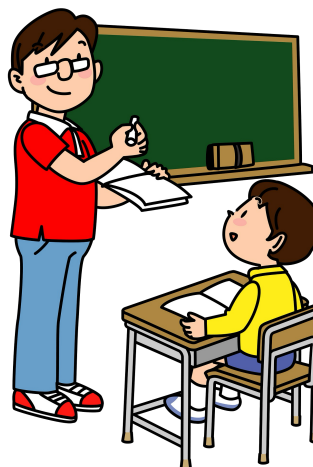
#### Closing Note:

Encourage students to practice recursion outside of the classroom and explore its applications in programming. Emphasize that mastering recursion requires regular practice and exposure to diverse problem-solving scenarios.

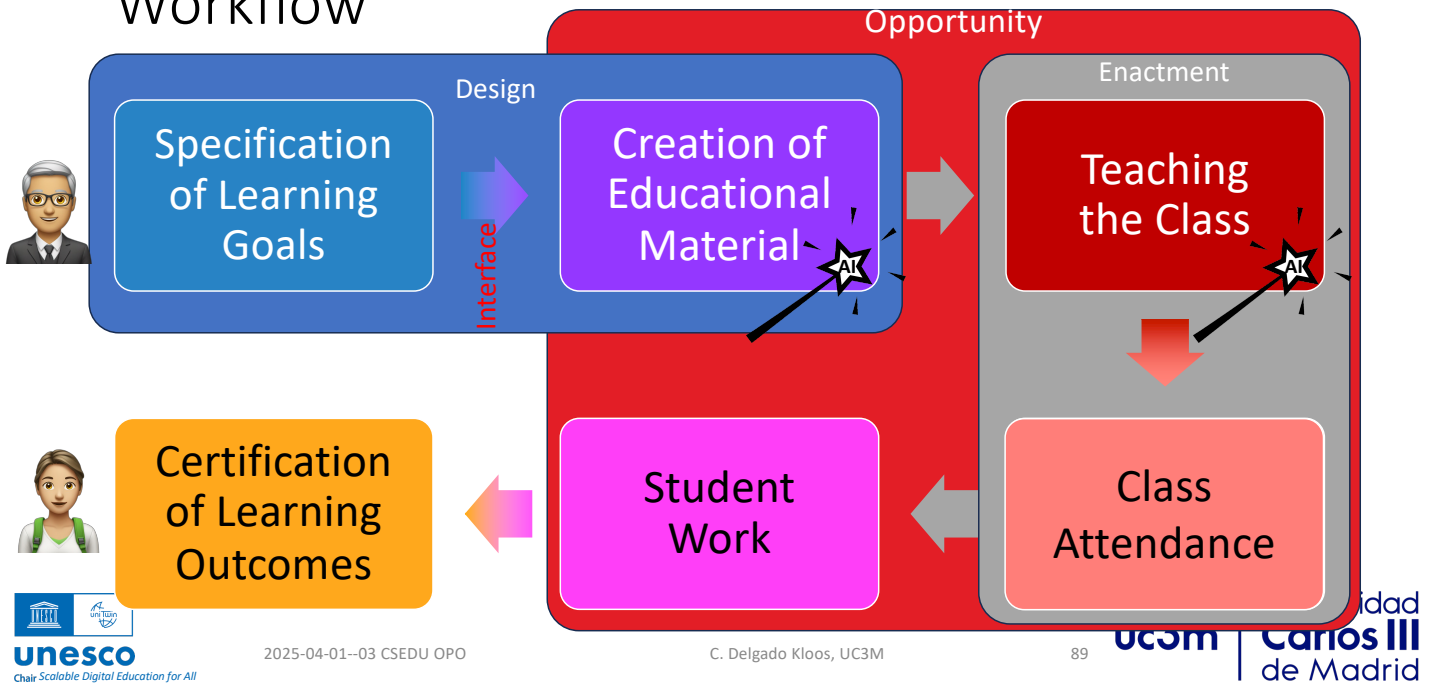
# Feedback

## Teaching the Class

- Automated feedback to open questions
  - should be reviewed by the teacher



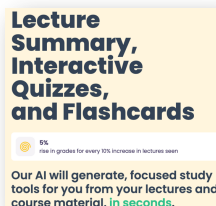
## Workflow



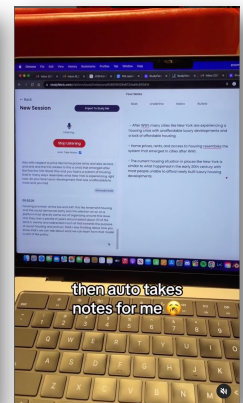
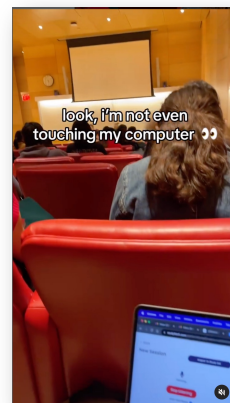
## Class Attendance

- Record the professor presenting
  - Transcribe the talk into text
  - Translate to another language
  - Simplify, explain, illustrate, give examples
  - Check for correctness?

• **studyfetch.com**



**Class Attendance**



# Meeting Assistants

- Transcription
- Translation
- Meeting notes
- Summary and insights
- Key actions and decisions
- Voice identification
- Sentiment analysis
- Conversation analytics

FATHOM

fireflies.ai

AVOMA

airgram

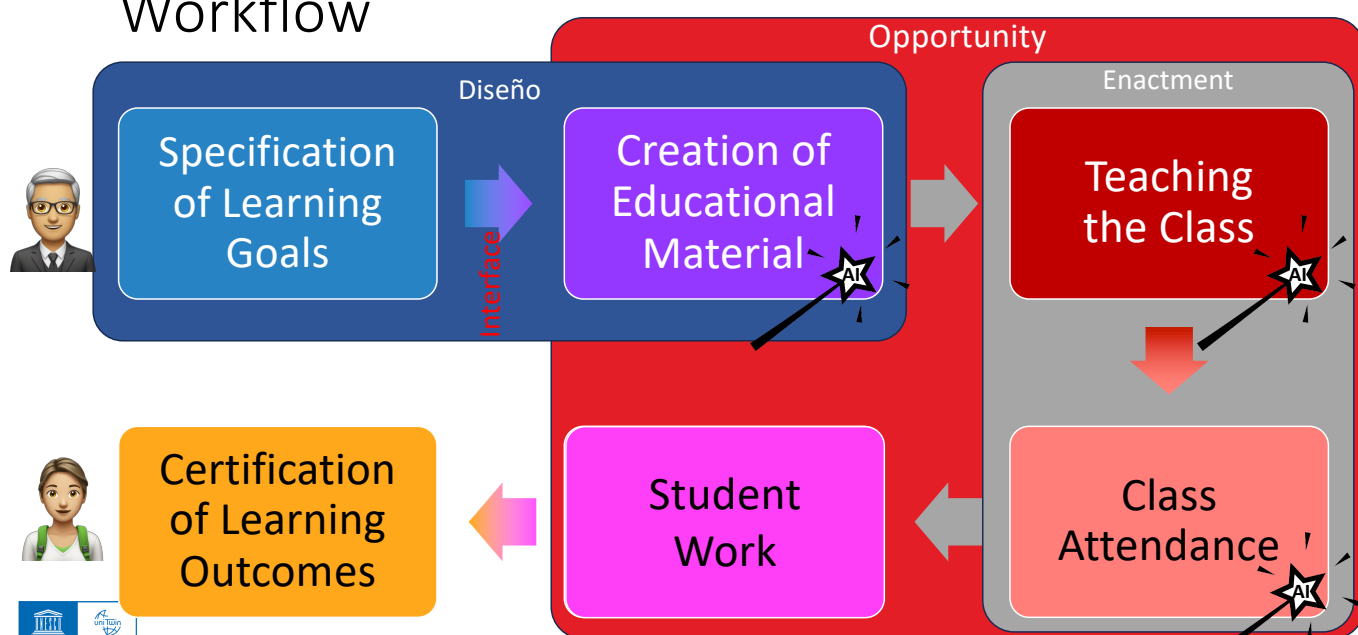
krisp

tl;dv

Equal Time  
Rewatch

Class  
Attendance

# Workflow



Student Work

Student  
Work

Independent  
Study



Collaborative  
Study



Assessment

Student Work

Student  
Work

Independent  
Study



Collaborative  
Study



Assessment

# Independent Study: Tutoring

Student Work

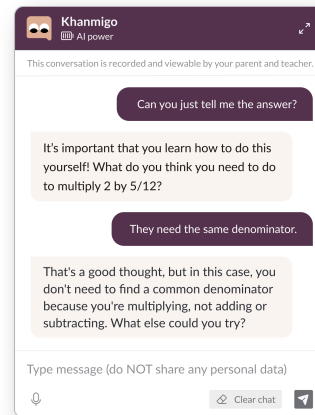
- Khanmigo by Khan Academy



- Max by Duolingo

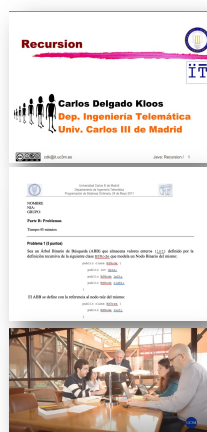


- AI Tutor at UAE



# Independent Study: CharlieBOT

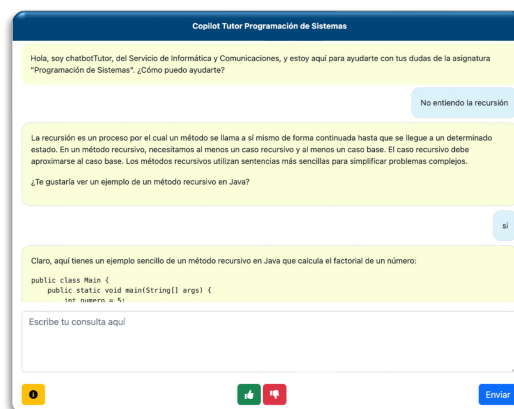
Student Work



slides

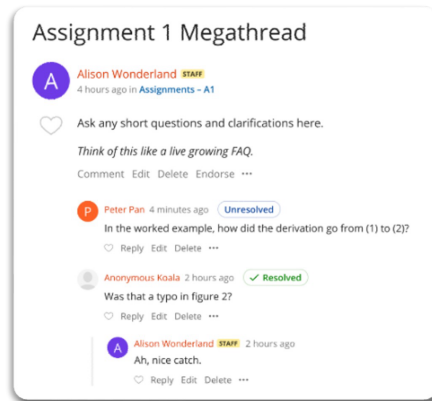
problem sets & exams

videos from edX MOOC



# Collaborative Study: Forums

Student  
Work

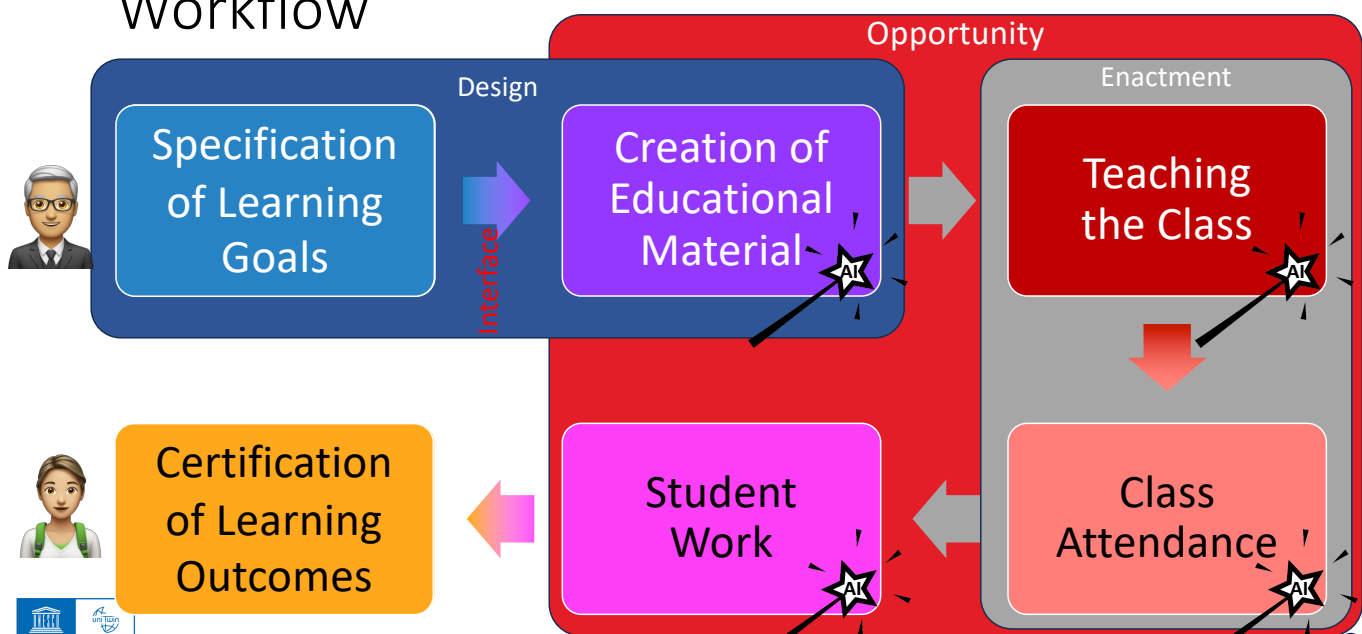


edstem.org



David Malan  
Harvard U

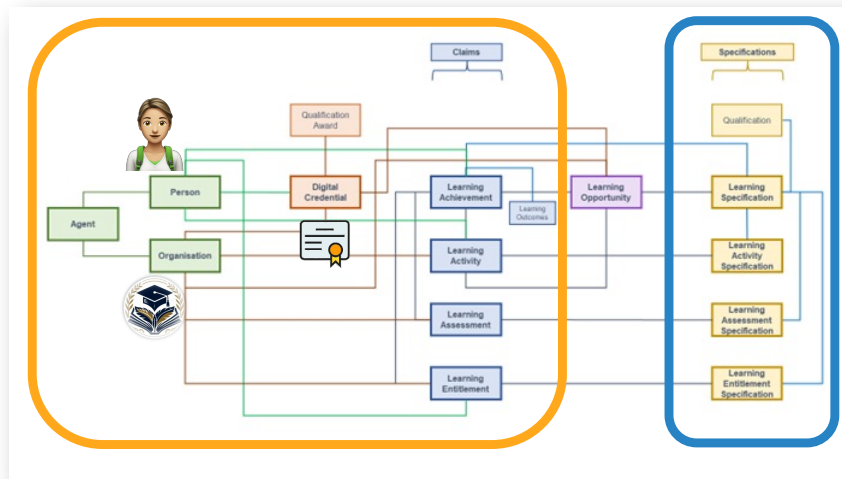
## Workflow





Certification  
of Learning  
Outcomes

Specification  
of Learning  
Goals



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Specification of Learning Goals

Specification  
of Learning  
Goals

Specification of  
Skills and  
Competences

Research for  
Class  
Preparation

Course  
Syllabus

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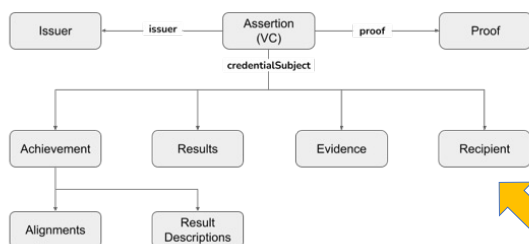
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# Creation of the Digital Credential

Certification  
of Learning  
Outcomes

OpenBadges (1EdTech)

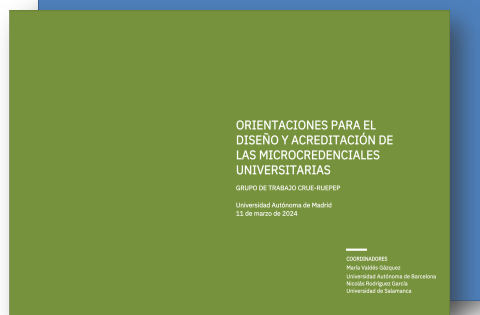
ELM (European Commission)



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# Description of Properties

Certification  
of Learning  
Outcomes

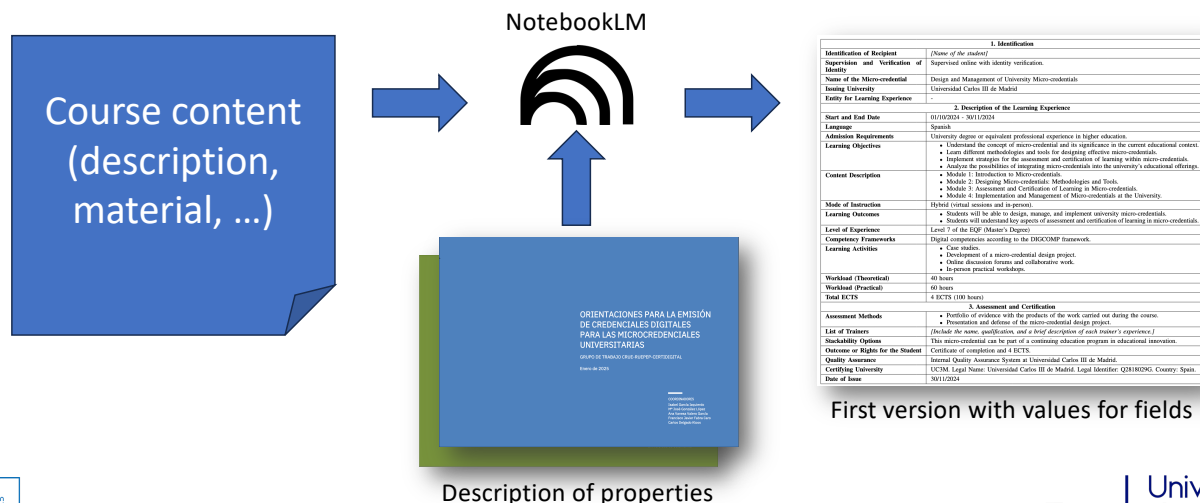


Identificación de la persona que recibe la certificación
Supervisión y verificación de la identidad <sup>2</sup> durante la formación y la evaluación
Denominación de la microcredencial universitaria
Universidad que imparte la microcredencial universitaria (pueden ser varias)
Universidad, entidad, institución, organismo, empresa, en la que se realiza el aprendizaje (si es distinto de la universidad que imparte la formación)
Fecha de inicio y fin de la actividad formativa
Idioma
Requisitos previos de acceso y criterios de admisión (nivel de acceso y/o descripción de conocimientos previos)
Objetivos, definidos de forma clara en función de las personas destinatarias y la finalidad de la formación
Descripción de los contenidos de la formación
Modalidad de enseñanza (presencial, virtual, híbrida)
Resultados del aprendizaje y tipo de logro <sup>3</sup>

Nivel de la experiencia de aprendizaje <sup>4</sup> (marcos de cualificaciones)
Marcos competenciales: ESCO / DIGCOMP / Otros
Actividades de aprendizaje (teóricas y prácticas)
Volumen de trabajo teórico necesario para obtener los resultados del aprendizaje (en créditos ECTS y horas, cuando sea posible)
Volumen de trabajo práctico necesario para obtener los resultados de aprendizaje (en créditos ECTS y horas, cuando sea posible)
Tipo de pruebas de evaluación que validan los resultados de aprendizaje (aplicación de una habilidad, presentación de un video, portafolio, etc.)
Listado de formadores (cualificación y experiencia profesional)
Opciones de integración o aplanabilidad (independiente, integrada, apilable con otras microcredenciales)
Resultado o derecho <sup>5</sup> para el estudiante
Tipo de garantía o procedimiento de aseguramiento de la calidad utilizado
Universidad que expide la certificación (razón social, identificador legal obligatorio, país o región de expedición)
Fecha de expedición

# Case Study

## Certification of Learning Outcomes



# Under Development

- An agentic system for the efficient definition of microcredentials



cren.ai

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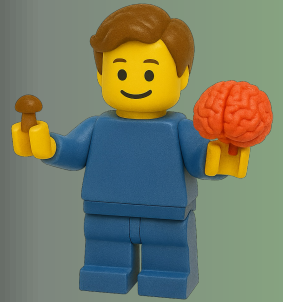
## Conclusion

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# AI isn't disrupting education.



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AI is  
disrupting the  
industrial  
model of  
education.



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2021

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We've spent 100+  
years treating  
students like  
widgets on an  
economic  
conveyor belt.



Chair: Scalable Digital Education for All

2021

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AI can humanize  
education if we  
rethink what  
education is for  
and why it matters.



Chair Scalable Digital Education for All

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## Physical Work



Chair Scalable Digital Education for All

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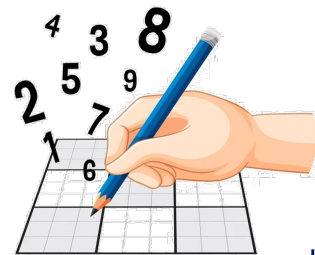
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# Intellectual Work



# First Photo: End of Paintings?



Joseph N. Niepce,  
1833



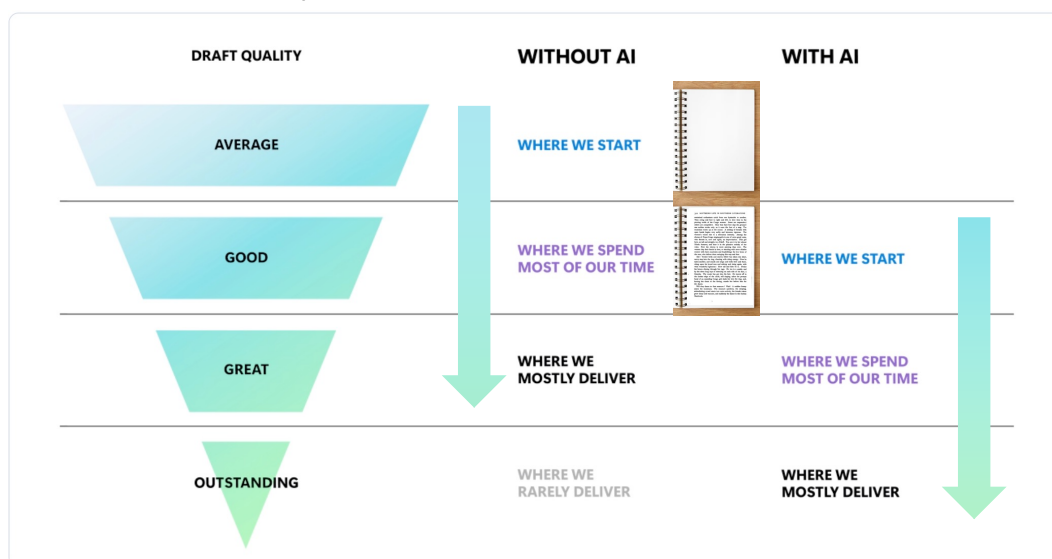
# End of Paintings? Beginning of a New Creativity



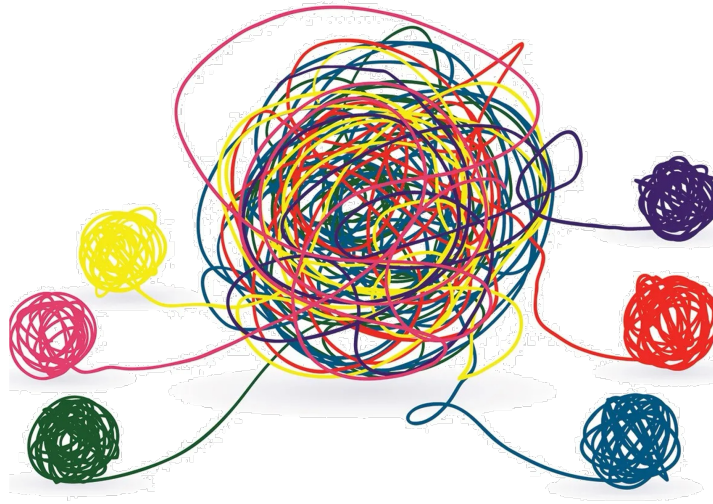
Joseph N. Niepce,  
1833



## Better Quality



# Solve Wicked Problems!



## Take-Aways

- From single mode interns
- To multimodal interns
- To reasoning interns
- To agentic systems of specialized interns



# Take-Aways

- Critical thinking
  - From doing to checking

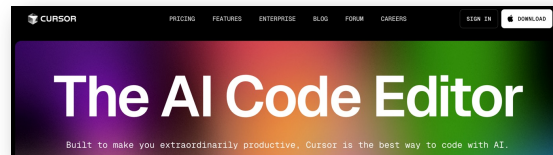
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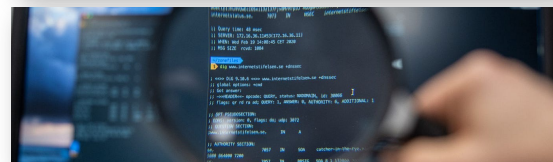
~~51.387~~ × 8.736 = ~~448.926.832~~ ⚡  
Multiple of 3 ❌      Not multiple of 3 ❌



- Vibe coding with AI


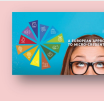


- Like software testing



# Take-Aways

- Rethinking the university with micro-credentials

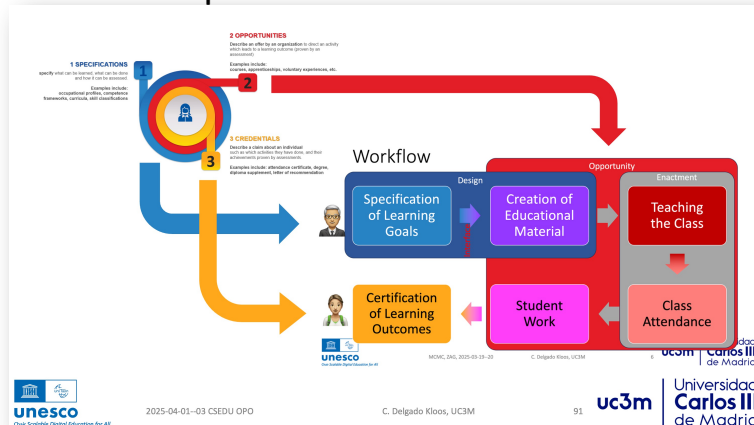
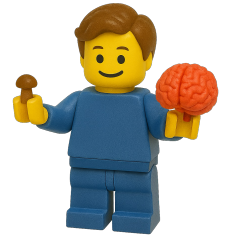
 <b>Degrees</b>	 <b>Microcredentials</b>
<ul style="list-style-type: none"> <li>• <b>Just-in-case learning</b></li> <li>• Harmonized length in Europe</li> <li>• Goal: fundamentals</li> <li>• Students with known knowledge</li> <li>• Slow change of offers</li> <li>• Complex updating process</li> <li>• Rigid teaching assignment</li> <li>• Disciplinarity</li> <li>• Paper certification</li> <li>• Quality assurance by program</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Just-in-time learning</b></li> <li>• Length not harmonized in Europe</li> <li>• Goal: re-/up-skill</li> <li>• Students with basic but diverse knowledge</li> <li>• Fast demand-driven offering</li> <li>• Fast updating</li> <li>• Agile and flexible teaching assignment</li> <li>• Multidisciplinarity</li> <li>• Digital certification</li> <li>• Impossible to assure quality for each microcredential</li> </ul>



# Take-Aways

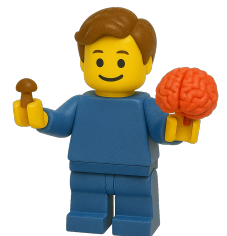
- A Model for the creation of micro-credentials
- AI can be used at all steps

crewAI



# Take-Aways

- Rethink education
- Solve wicked problems





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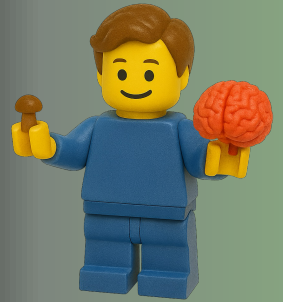
## Smaller and Smarter: Trends in Education

Carlos Delgado Kloos

Universidad Carlos III de Madrid

[educate.uc3m.es](http://educate.uc3m.es)

[it.uc3m.es/cdk](http://it.uc3m.es/cdk)



Thank you!

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Obrigado!

