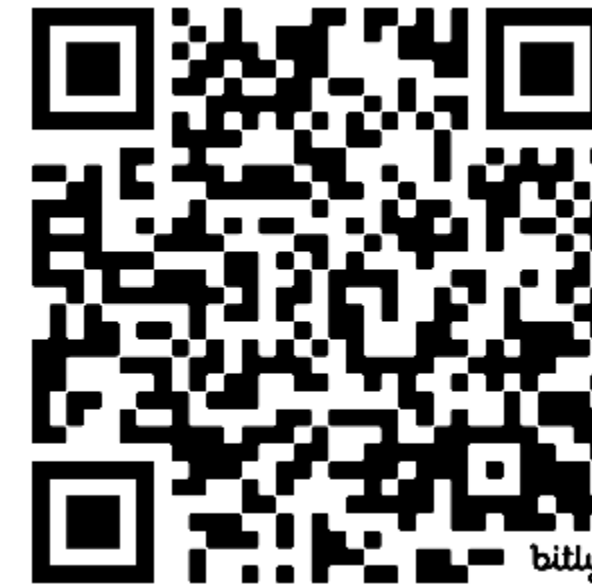




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Navigating the Rapidly Evolving Landscape of AI in Education

A Researcher's Perspective

H. Chad Lane

Professor of Educational Psychology & Computer Science

Director, NSF-IES INVITE AI Institute

University of Illinois, Urbana-Champaign

<http://hchadlane.net> | hclane@illinois.edu

CSG Midwest - Learning Lab - AI in Education
Saint Paul, MN - 1 September 2026



I'm think about two big questions:

What *is* AI doing to Education?

What *can* AI do for Education?

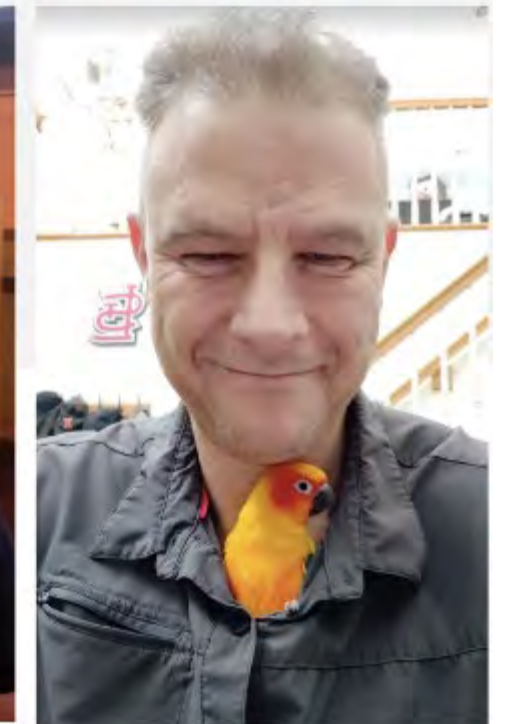


<https://bit.ly/CSG-HCL>



University of Pittsburgh / LRDC 1998-2004 (LRDC @Pitt)

Who am I?



Truman State Univ.

Granite City, IL



Illinois & NSF INVITE AI Institute
2015 - Present

University of Southern
California / ICT
2004 - 2015



NSF AI Institutes





30 NSF AI Institutes

Each Institute is designed to...

- Significantly **advance research in AI** in a multi-disciplinary, multi-institutional collaborative setting
- Accelerate the development of **transformational, AI-powered innovation**
- **Grow a workforce** of future AI researchers and practitioners
- Become **nexus points** for collaboration between universities, federal agencies, industries, and nonprofits



AI Institutes directory and news:
<https://aiinstitutes.org>





NATIONAL AI RESEARCH INSTITUTES

The NSF-led National AI Research Institutes Program is the nation's largest AI research ecosystem and is supported by a partnership of federal agencies and industry leaders.



The map reflects the approximate location of the lead organizations and subawards.

[Main Map](#)

Select Awards by year

[2020 Awards](#)

[2021 Awards](#)

[2023 Awards](#)

[2024 Awards](#)

[2025 Awards](#)

Select Awards by Institution

NSF AI Institute for Agent-based Cyber Threat Intelligence and Operation (NSF ACTION)

University of California, Santa Barbara

NSF AI Institute for Artificial and Natural Intelligence (NSF ARNI)

Columbia University

AI Institute for Collaborative Assistance and Responsive Interaction for Networked Groups (AI-CARING)

Georgia Tech

AI Institute for Exceptional Education (AI4ExceptionalEd)

University at Buffalo

AI Institute for Inclusive Intelligent Technologies for Education (INVITE)

University of Illinois Urbana-Champaign

NSF AI Institute for Adult Learning and Online Education (NSF ALOE)

Georgia Tech

NSF AI Institute for Advances in Optimization (NSF AI4OPT)

Georgia Tech

NSF AI Institute for Artificial Intelligence and Fundamental Interactions (NSF IAIFI)

Massachusetts Institute of Technology

NSF AI Institute for Edge Computing Leveraging Next-generation Networks (NSF Athena)

Duke University

NSF AI Institute for Engaged Learning (NSF ENGAGE AI Institute)

North Carolina State University

NSF AI Institute for Foundations of Machine Learning (NSF IFML)

The University of Texas at Austin

NSF AI Institute for Future Edge Networks and Distributed Intelligence (NSF AI-EDGE)

The Ohio State University

NSF AI Institute for Intelligent Cyberinfrastructure with Computational Learning in the Environment (NSF ICICLE)

The Ohio State University

NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (NSF AI2ES)

University of Oklahoma

NSF AI Institute for Societal Decision Making (NSF AI-SDM)

Carnegie Mellon University

NSF Institute for Student-AI Teaming (NSF iSAT)

University of Colorado Boulder

NSF AI Institute for Dynamic Systems (NSF Dynamics AI)

University of Washington

NSF AI Institute for Molecular Discovery, Synthetic Strategy, and Manufacturing (NSF Molecule Maker Lab or NSF MMLI)

University of Illinois Urbana-Champaign

NSF-Simons AI Institute for Cosmic Origins (CosmicAI)

University of Texas at Austin

NSF-Simons AI Institute for the Sky (SkAI)

Northwestern University

AI Institute for Trustworthy AI in Law and Society (TRAILS)

University of Maryland, College Park

NSF AI Institute for Learning-Enabled Optimization at Scale (NSF TILOS)

University of California San Diego

Institute for Agricultural AI for Transforming Workforce and Decision Support (USDA-NIFA AgAID)

Washington State University

AI Institute for Climate-Land Interactions, Mitigation, Adaptation, Tradeoffs and Economy (USDA-NIFA AI-CLIMATE)

University of Minnesota, Twin Cities

AI Institute for Future Agricultural Resilience, Management, and Sustainability (USDA-NIFA AIFARMS)

University of Illinois Urbana-Champaign

AI Institute for Next Generation Food Systems (USDA-NIFA AIFS)

University of California, Davis

AI Institute for Resilient Agriculture (USDA-NIFA AIIRA)

Iowa State University

NSF AI Research Institute on Interaction for AI Assistants (NSF ARIA)

Brown University

NSF AI-Materials Institute (NSF AI-MI)

Cornell University

NSF AI Institutes and Midwestern Legislator Proximity (2026)

State	NSF AI Institutes in the State (host campus)	Committee Members (Education & Workforce Development)
Illinois	UIUC ¹ — INVITE (lead), MMLI (lead), AIFARMS (lead), AIFS, iSAT, ACTION, AI-EDGE, Athena, SkAI (NCSA); Univ. of Chicago ² — AIFARMS, ACTION, SkAI; Univ. of Illinois Chicago — ACTION, AI-EDGE, Athena, SkAI; Northwestern Univ. — SkAI (lead); Argonne Nat'l Lab & Fermilab ³ — SkAI	Sen. Chris Balkema ¹ , Sen. Meg Loughran Cappel ³ , Rep. Marcus Evans ² , Sen. Karina Villa ³ , Rep. Amy Elik, Rep. Daniel Swanson
Indiana	Purdue Univ. (West Lafayette) — ACTION, AI-EDGE, AI-LEAF/AI-CLIMATE; Indiana Univ. (Bloomington) — MMLI, ICICLE, ENGAGE AI	Rep. Robert Behning, Rep. Michelle Davis, Rep. Renee Pack, Sen. J.D. Ford, Sen. Jeff Raatz, Sen. Linda Rogers
Iowa	Iowa State Univ. (Ames) — AIIRA (lead), ICICLE	
Kansas	Kansas State Univ. (Manhattan) ¹ — AgAID; Wichita State Univ. ² — IFML	Sen. Mike Argabright ¹ , Rep. Susan Estes ² , Rep. Jesse Borjon, Sen. Pat Pettey, Rep. Mari-Lynn Poskin, Sen. T.J. Rose, Rep. Valdenia Winn
Michigan	Univ. of Michigan (Ann Arbor) ¹ — INVITE, Athena, AI-EDGE; Michigan State Univ. — AIFARMS; Central Michigan Univ. — AI2ES	Sen. Mary Cavanagh ¹ , Sen. Dayna Polehanki ¹
Minnesota	Univ. of Minnesota Twin Cities ¹ — AI-CLIMATE / AI-LEAF (lead)	Sen. Heather Gustafson ¹ , Rep. Julie Greene ¹ , Sen. Zaynab Mohamed ¹ , Rep. Samantha Sencer-Mura ¹ , Rep. Patricia Mueller, Rep. Bernie Perryman
Nebraska	Univ. of Nebraska—Lincoln ¹ — AIIRA	Sen. Jana Hughes ¹ , Sen. John Cavanaugh, Sen. Wendy DeBoer, Sen. Rick Holdcroft, Sen. Margo Juarez, Sen. Kathleen Kauth, Sen. Terrell McKinney
North Dakota	— (no NSF AI Institute prime or partner)	Rep. Pat Heinert, Rep. Jim Jonas
Ohio	Ohio State Univ. & Ohio Supercomputer Center (Columbus) — AI-EDGE (lead), ICICLE (lead); Case Western Reserve Univ. (Cleveland) ¹ — ICICLE; Wright State Univ. (Dayton) — INVITE	Rep. Gayle Manning ¹ , Rep. Marilyn John, Rep. Josh Williams
South Dakota	— (no NSF AI Institute prime or partner)	
Wisconsin	Univ. of Wisconsin—Madison — Athena, AI-EDGE, ICICLE, iSAT, SkAI	Rep. Deb Andraca, Rep. Joel Kitchens, Sen. Bradley Pfaff

Superscripts link a legislator to the institute campus in or adjoining their district. "Lead" = institute headquarters. Sources: NITRD FY2025 National AI Institutes appendix; NSF AI Institutes map; individual institute partner pages. Saskatchewan and Manitoba committee members are not shown — no NSF/USDA AI Institute has a Canadian prime or subaward partner in those provinces.



Cary Coglianese  • 3rd+

Edward B. Shils Professor of Law Director, Penn Program on Reg...

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New paper: "On Leashing (and Unleashing) AI Innovation," with [Colton Crum](#).

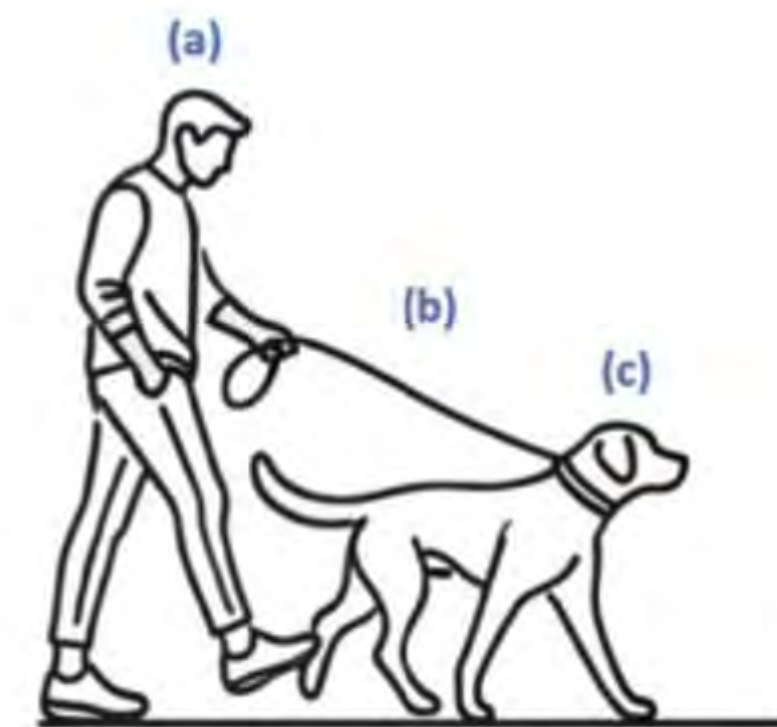
Instead of enacting "guardrails" around artificial intelligence, we propose an alternative way of conceiving of AI regulation, one that allows innovation to flourish while still, importantly, assuring it remains under attentive human oversight. We call it regulating through "leashes."

Building on an analogy of AI to animal intelligence, we draw out in this paper implications for an alternative conception of AI governance that demands that AI developers and users seek to identify risks and develop robust internal practices to manage them. We explain how conceiving AI governance in terms of leashes holds virtues that governance as guardrails does not.

One of these virtues, paradoxically, may be that by leashing AI through responsible human management oversight, rather than trying futilely to keep it within some fixed guardrails, AI governance can help unleash technological innovation so that it produces positive value for society.

Full paper: ► <https://lnkd.in/euzjMQWV>

Figure 1: Leashing Artificial Intelligence



A Leashes Mindset: How to motivate the humans that develop and use AI to keep it responsibly and safely trained, overseen, and able to be restrained (or pulled back) in the face of danger.

I'm think about two big questions:

What *is* AI doing to Education?

What *can* AI do for Education?



<https://bit.ly/CSG-HCL>

Teachers and Learners Are Using AI (“arrival technology”)

60%

of K–12 teachers used AI
for their work

Gallup / Walton, Feb–Mar 2026

86%

of kids ages 9–17 have
used AI

Common Sense Media, Mar 2026

70%

of teens use AI for
schoolwork

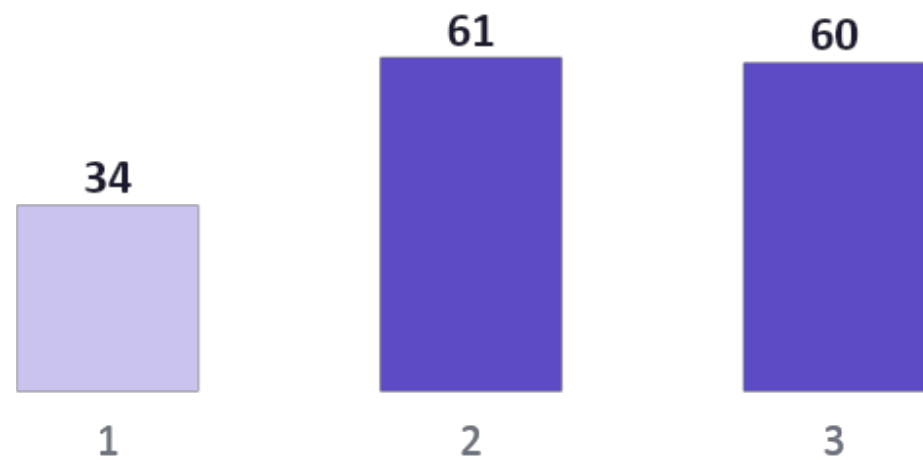
Common Sense Media, Aug 2026

82%

of teachers have received
NO formal AI guidance

Gallup / Walton, Feb–Mar 2026

Teacher AI use: surge, then plateau



Roughly 6 in 10 teachers now use AI — nearly double the rate of two years ago. The classroom question is no longer whether, but under what rules.

Students: AI is already routine

- 85% of young AI users use it for schoolwork; 48% do so weekly, 21% daily
- Use rises with age: 81% of 9–12s, 92% of 16–17s have used AI
- 54% of teens have used a chatbot for schoolwork; 10% use one for all or most of it
- 44% hit a blocked AI tool at school; 59% of those just switch to a personal device
- 59% of teens believe AI cheating happens regularly at their school

The guidance gap (the policy lever)

- 34% of teachers get no guidance at all; another 48% get only informal guidance
- 69% have no guidance on using AI for tutoring; 58% none on grading and feedback
- 73% of teens say no teacher has talked with them about using AI safely
- Only 45% of principals report a school or district AI policy
- Just 35% of districts had provided students any AI training as of spring 2025

“Not in my classroom”

"ChatGPT-5 can now mimic a student's writing so precisely that I struggle to tell the difference."

"GenAI is an entirely different kind of disruption. It does not just solve a step — it can take over the entire process"

"The slow, sometimes frustrating process of wrestling with a sentence, choosing the evidence that best supports an argument or discovering a new insight mid-draft — these are the moments when thinking happens, however time-consuming, inconvenient and uncomfortable."

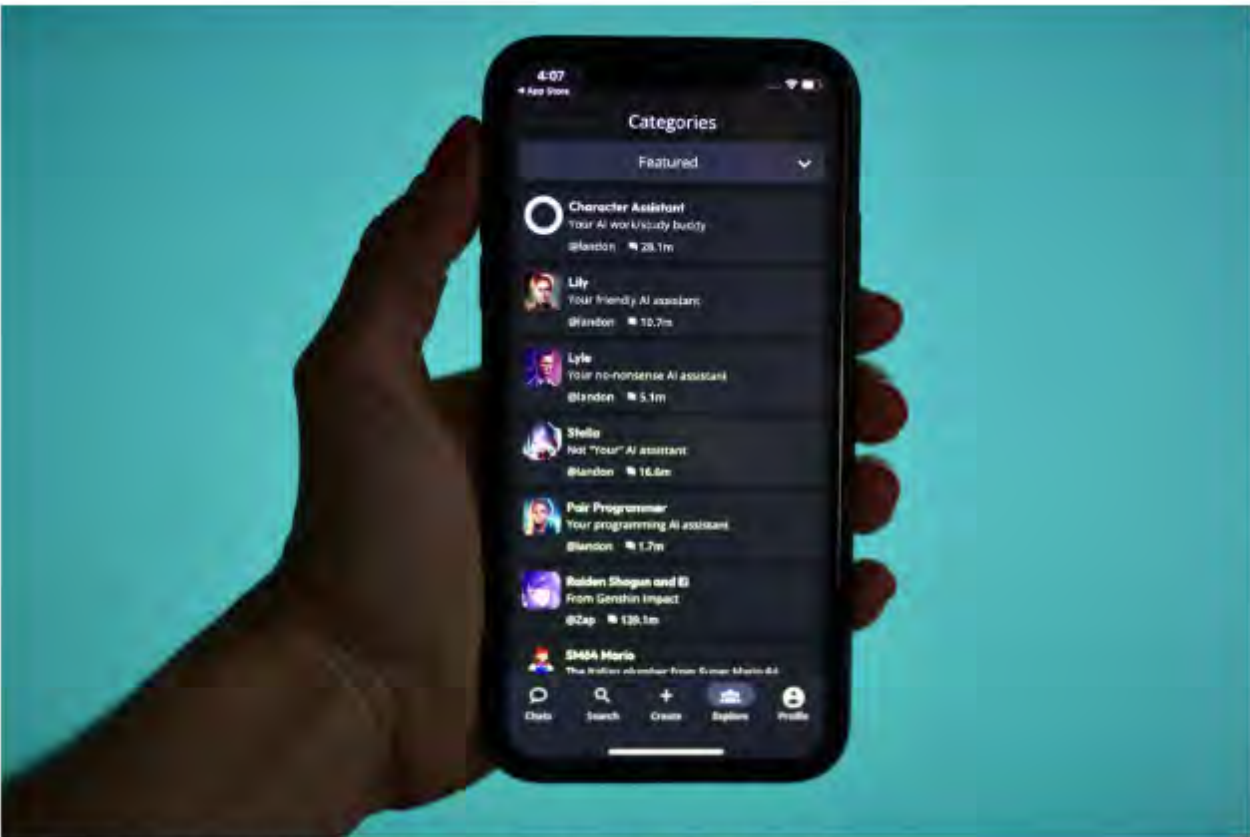


Courtesy: David Cutler

About the author

David Cutler teaches American history, government and journalism at Brimmer and May, an independent school in Chestnut Hill, Mass. His writing has appeared in the National Association of Independent Schools, PBS News Hour, Edutopia, The Atlantic and Independent School Magazine. David created the Private School Journalism Association in 2019 and is its executive director. Follow David on Twitter [@spinedu](https://twitter.com/spinedu).

Teens are spilling dark thoughts to AI chatbots. Who’s to blame when something goes wrong?



The Character.AI app includes chatbots created by users. (Gabby Jones / Bloomberg via Getty Images)

By Queenie Wong
Staff Writer
Feb. 25, 2025 3 AM PT

Share 12

- A growing number of teens are turning to AI chatbots for advice and emotional support.
- Character.AI, an AI startup, is among tech companies grappling with legal and ethical issues after parents alleged the platform’s chatbots harmed their children.

When her teen with autism suddenly became angry, depressed and violent, the mother searched his phone for answers.

She found her son had been exchanging messages with chatbots on Character.AI, an

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LAPD officers accused of making racist and sexist remarks in recruiting office; mayor calls it ‘outrageous’

FEMA rejects call by Newsom’s office to test soil in fire areas for toxic contaminants

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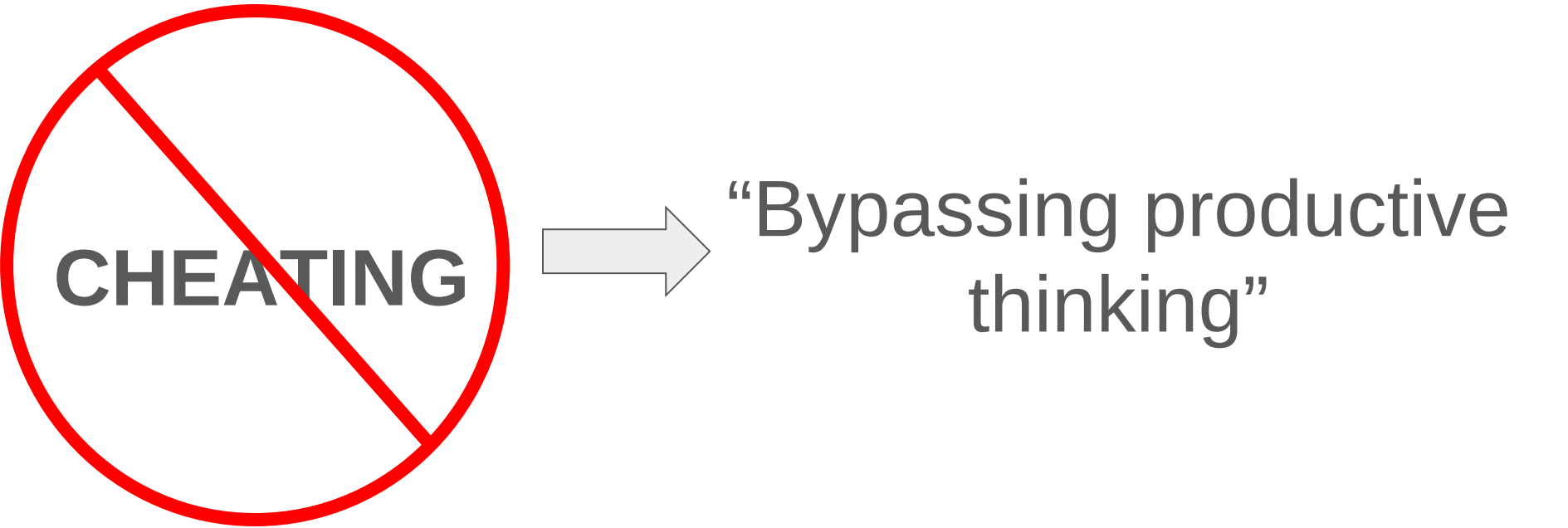
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Forget the celebrities. Meet L.A.’s small businesses that depend on the Oscars
Feb. 28, 2025

LAEDC estimates up to \$8.9 billion in lost economic output from Palisades, Eaton fires
Feb. 27, 2025



Generative AI and K-12 Education: An MIT Perspective

In November of 2022, a Silicon Valley company launched an invention that could complete students’ homework for them. Available only to subscribers at first, by the spring of 2023 OpenAI’s ChatGPT-3.5 was available to millions of students. As of January 2023, anyone with . . .

by Eric Klopfer, Justin Reich, Hal Abelson, and Cynthia Breazeal

last released 11 months ago

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CONTENTS

ABSTRACT

In November of 2022, a Silicon Valley company launched an invention that could complete students’ homework for them. Available only to subscribers at first, by the spring of 2023 OpenAI’s ChatGPT-3.5 was available to millions of students. As of January 2023, anyone with internet service can access the next generation, GPT-4, using Microsoft’s Bing, for free. ChatGPT and other emerging models like it are a form of generative AI, and its widespread

The Effortless Bypass Dilemma

What features of GenAI threaten to undermine learning?

General-purpose

Operates across all academic domains and task types

Frictionless

Cost of bypass has dropped to near zero (prompt + time to copy)

Anonymous

No/minimal social trace; unlike asking a friend or tutor

Non-judgmental

AI complies without questioning intent or ethics



With generative AI systems available, learners are able to bypass the part most beneficial to them.

What are the ingredients for robust learning?

Desirable Difficulties

Bjork & Bjork

Spacing, interleaving, and retrieval practice make learning feel harder but yield more durable and transferable knowledge. Ease of processing is a poor proxy for actual learning.

Productive Struggle

Warshauer

Engaging with challenging tasks or problems that require effort, critical thinking, and persistence to solve; includes obstacles, making mistakes, and experiencing discomfort.

Productive Failure

*Kapur;
Schwartz & Bransford*

Struggling with ill-structured problems before receiving instruction leads to deeper conceptual understanding. Initial failure reveals knowledge gaps and primes learners for direct instruction.

Impasse-Driven Learning

VanLehn

Learning happens most powerfully at impasses: moments when existing knowledge fails. Encountering and resolving these gaps is the engine of knowledge construction and restructuring.

Policy should empower educators and researchers to develop new, **integrated** approaches to preserve these critical features of learning.

Are LLMs good tutors? No, not really...

Generative AI Can Harm Learning

Hamsa Bastani,^{1*} Osbert Bastani,^{2*} Alp Sungu,^{1*†}
Haosen Ge,³ Özge Kabakcı,⁴ Rei Mariman

¹Operations, Information and Decisions, University of Pennsylvania

²Computer and Information Science, University of Pennsylvania

³Wharton AI & Analytics, University of Pennsylvania

⁴Budapest British International School

*These authors (H.B., O.B., A.S.) contributed equally.

†To whom correspondence should be addressed; E-mail: alpsungu@wharton.upenn.edu.

Generative artificial intelligence (AI) is poised to revolutionize how humans work, and has already demonstrated promise in significantly improving human productivity. However, a key remaining question is how generative AI affects *learning*, namely, how humans acquire new skills as they perform tasks. This kind of skill learning is critical to long-term productivity gains, especially in domains where generative AI is fallible and human experts must check its outputs. We study the impact of generative AI, specifically OpenAI's GPT-4, on human learning in the context of math classes at a high school. In a field experiment involving nearly a thousand students, we have deployed and evaluated two GPT based tutors, one that mimics a standard ChatGPT interface (called GPT Base) and one with prompts designed to safeguard learning (called GPT Tutor). These tutors comprise about 15% of the curriculum in each of three grades. Consistent with prior work, our results show that ac-

- The title?
- **LLMs by default do the thing you ask it to do. Not a good tutoring strategy.**
- They did attempt to suppress this behavior, but found no effect. THIS IS NORMAL!
- Best to evaluate against “business as usual”, not nothing or a weak control.
- Perhaps a lack of awareness of educational research?

I AM NOT RECOMMENDING THIS PAPER!

I'm think about two big questions:

What *is* AI doing to Education?

What *can* AI do for Education?

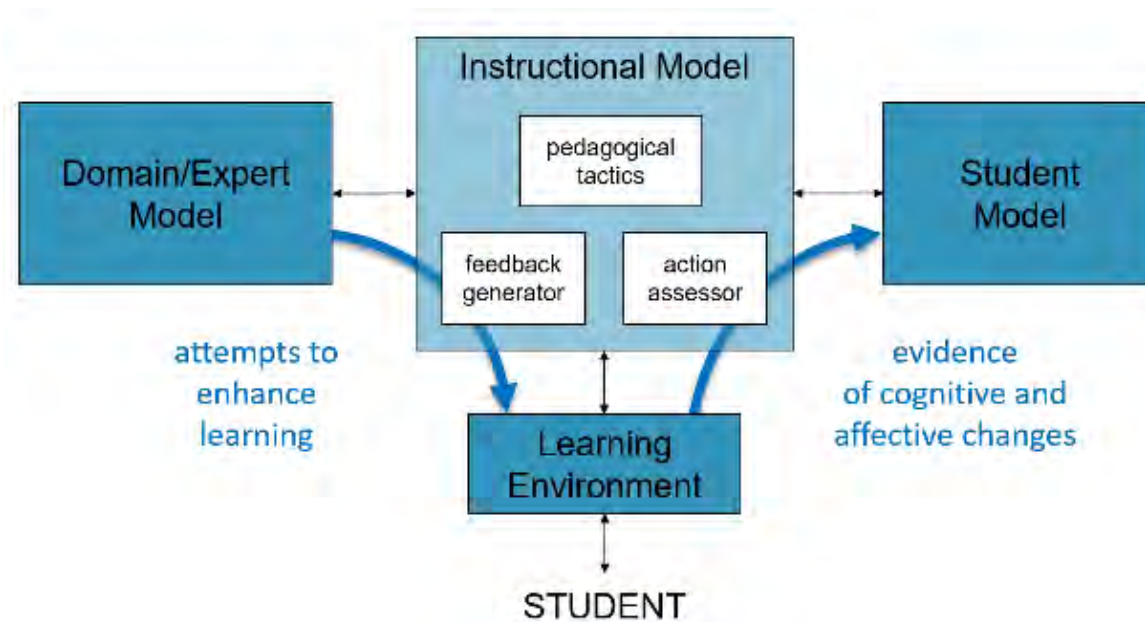


<https://bit.ly/CSG-HCL>

Disentangling “AI in Education”

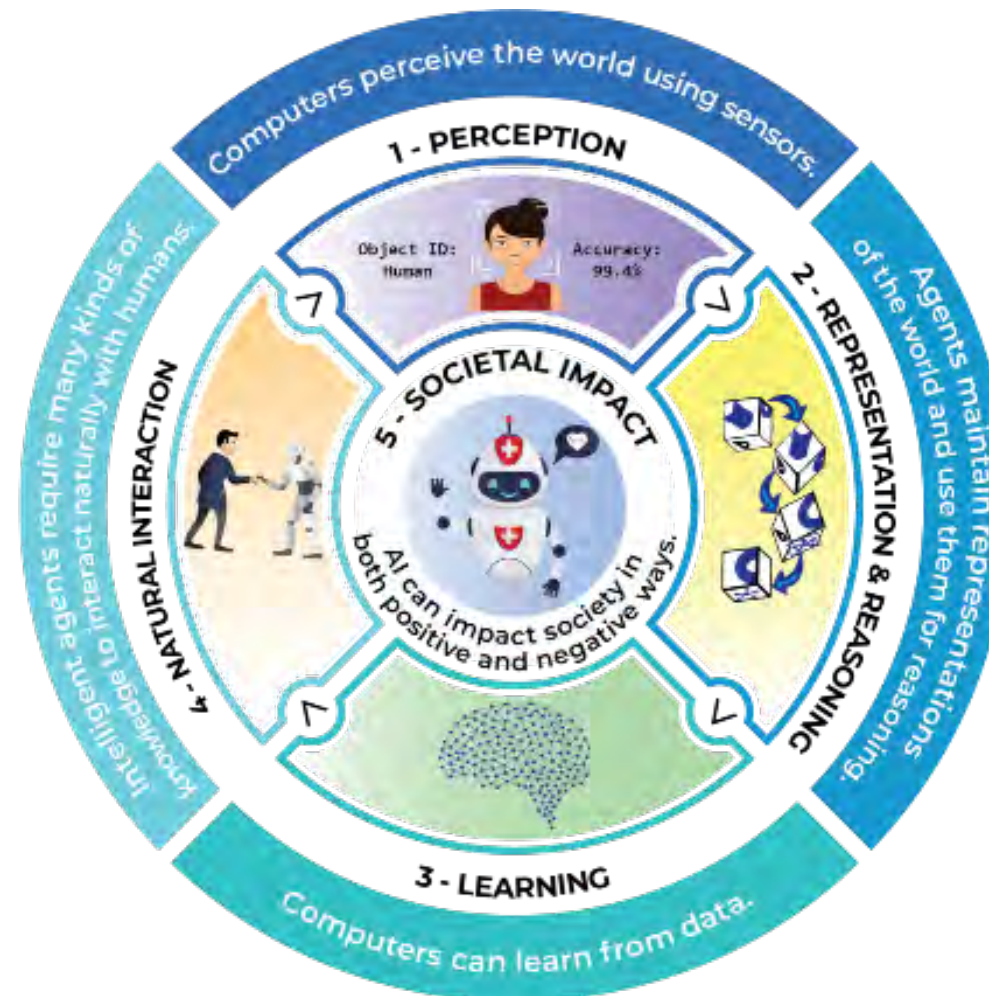
Teaching with AI:

- AI actively supports teaching & Learning
- Use AI to enhance learning, improve educational technologies, and support teachers
- Started in the 70s



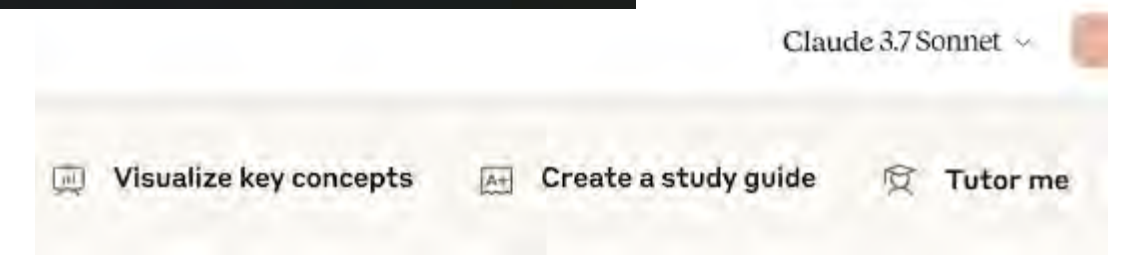
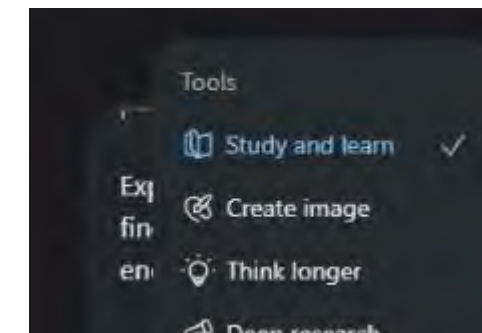
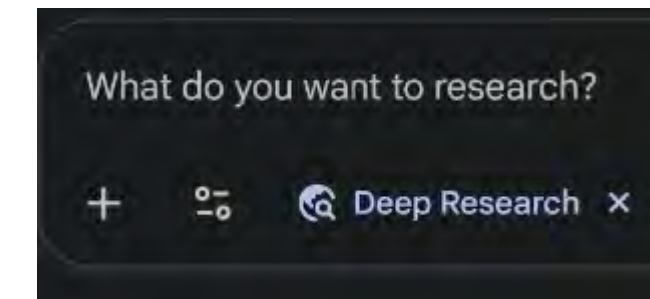
Teaching AI as a subject:

- AI *Education*
- Defining AI
- Gaining understanding how AI works, how it is built, how to improve it
- Computer Science

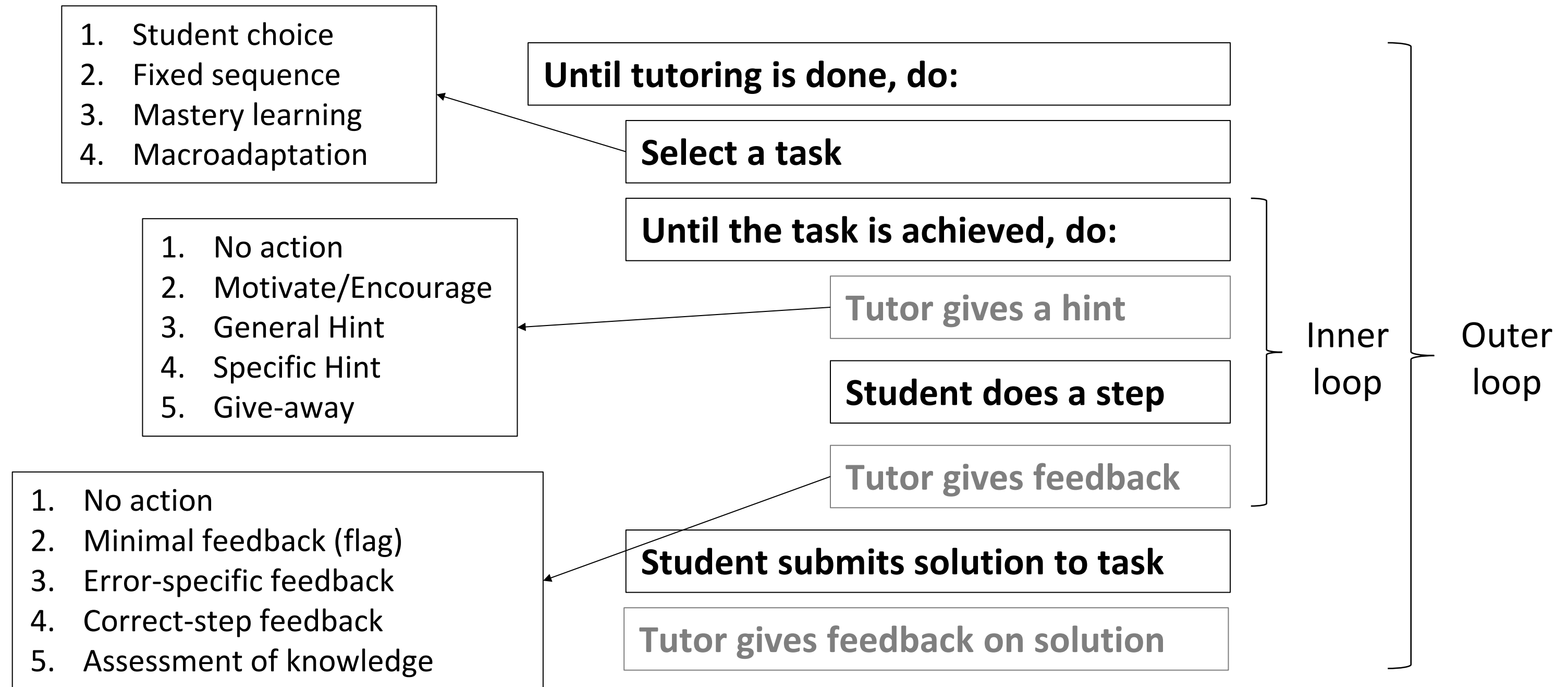


Using AI & AI Influence:

- AI *Literacy*
- Solving daily tasks
- Analysis, Brainstorming, & creative work
- Self-directed Learning
- Offloading / Bypassing

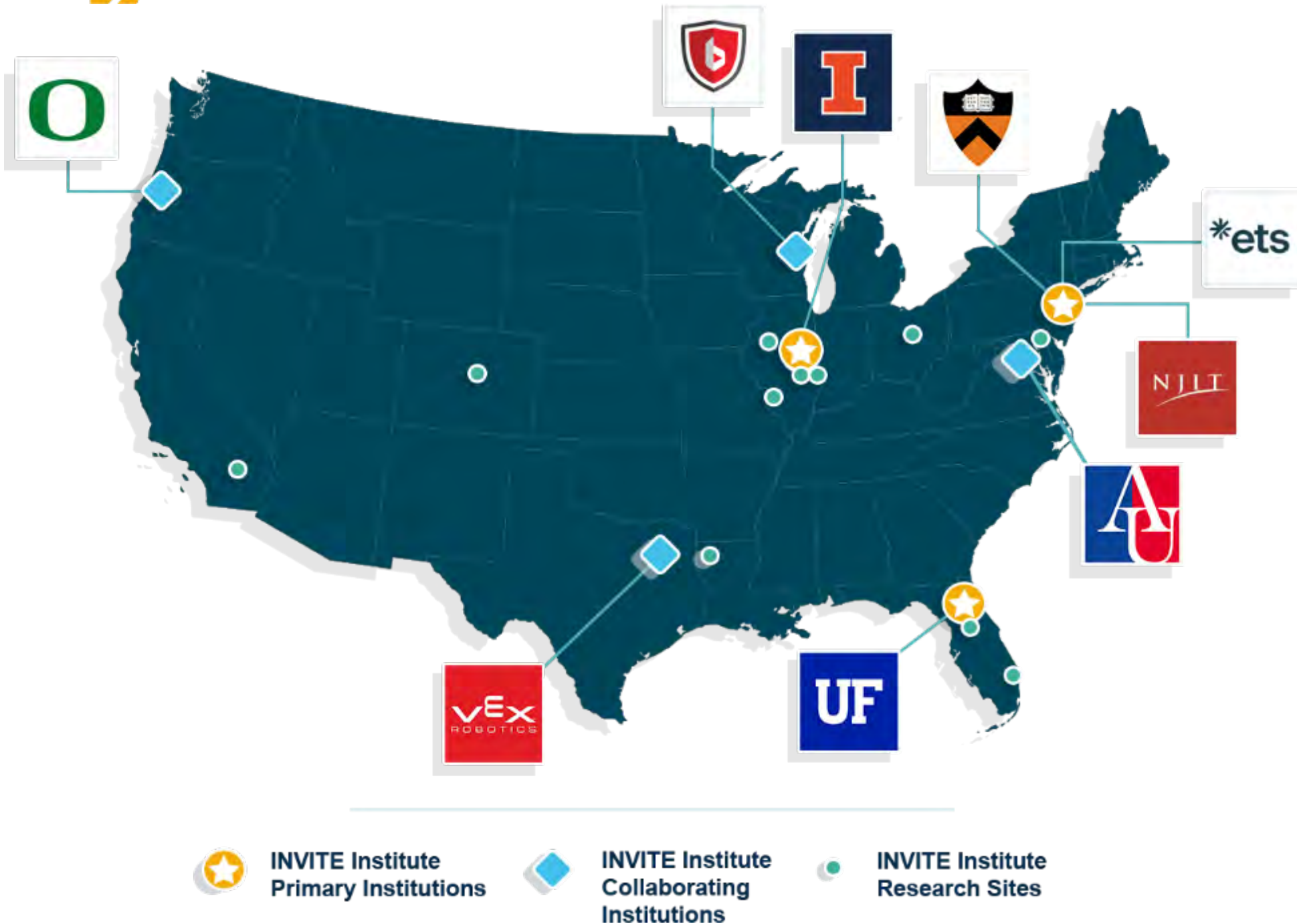


Science of Learning: What is effective tutoring?



Takeaway: When AI systems support the **inner loop**, in *pedagogically sound ways* you get the best outcomes





50+ colleges & universities

140K K12 outreach participants



H. Chad Lane (PI)
Illinois



Kristy Boyer (Co-PI)
UF



Cheng Zhai (Co-PI)
Illinois



Diego Zapata-Rivera
(Co-PI) ETS



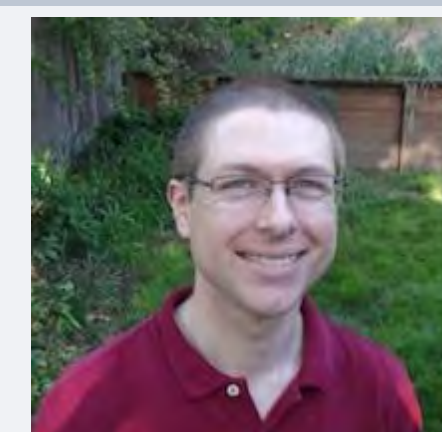
Jamie Payton (Co-PI)
NJIT



Rodney Hopson
American U.



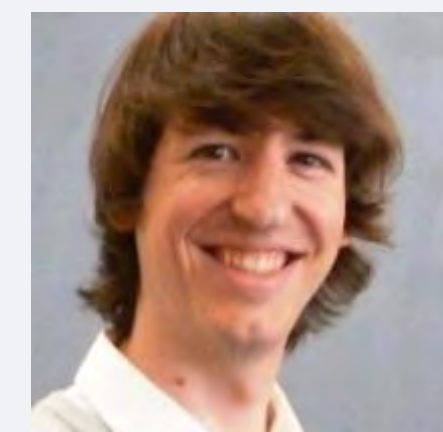
Suma Bhat
Princeton



Daniel Lowd
Oregon



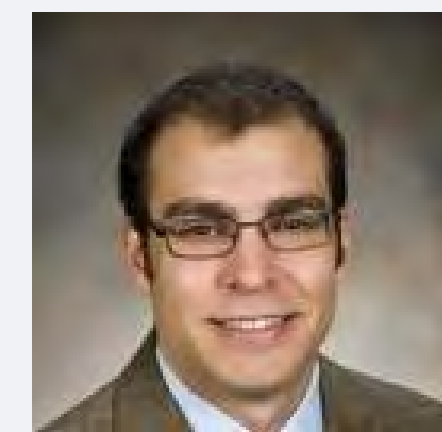
Blair Lehman
Brighter Research



Luc Paquette
Illinois



Maya Israel
UF



Noah Schroeder
UF

Management Team

Strand Leads

INVITE Guiding Research Objectives

PARC



Detect and Model PaRC in Context

Develop computational methods to detect/model PaRC from multimodal interaction data as students learn to code. Theory-driven ontologies, integrated learner models, and data collection in VEX VR.



Persistence



Academic
Resilience



Collaboration



Empower Teachers and Support Learners

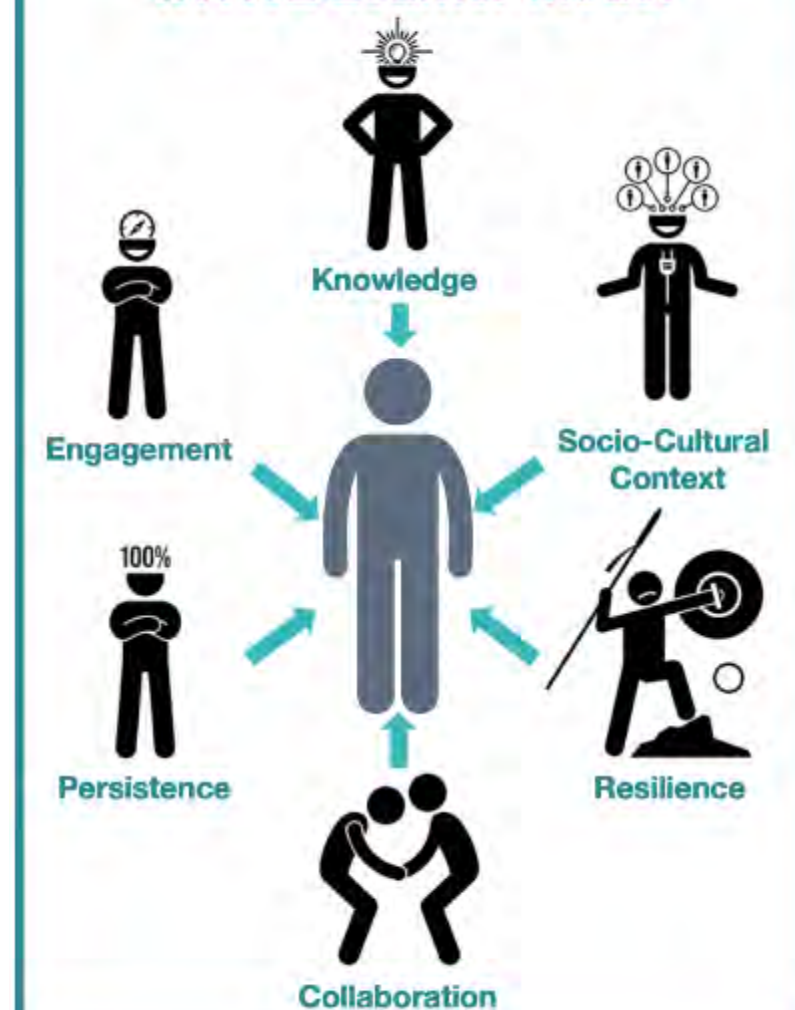
Build AI-enabled learning environments and teacher-facing tools that promote PaRC skill development w/pedagogical agents. Project Keating for teacher insights, co-design with teachers and students.



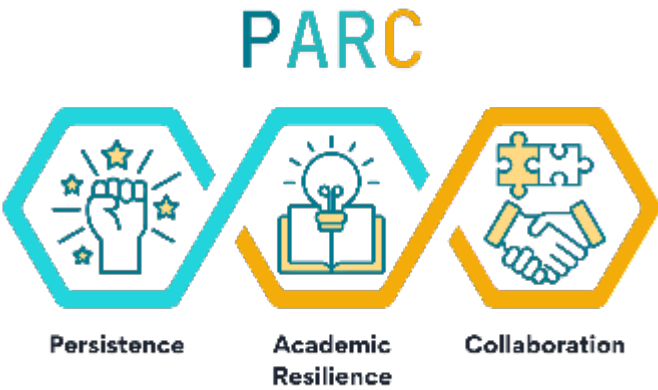
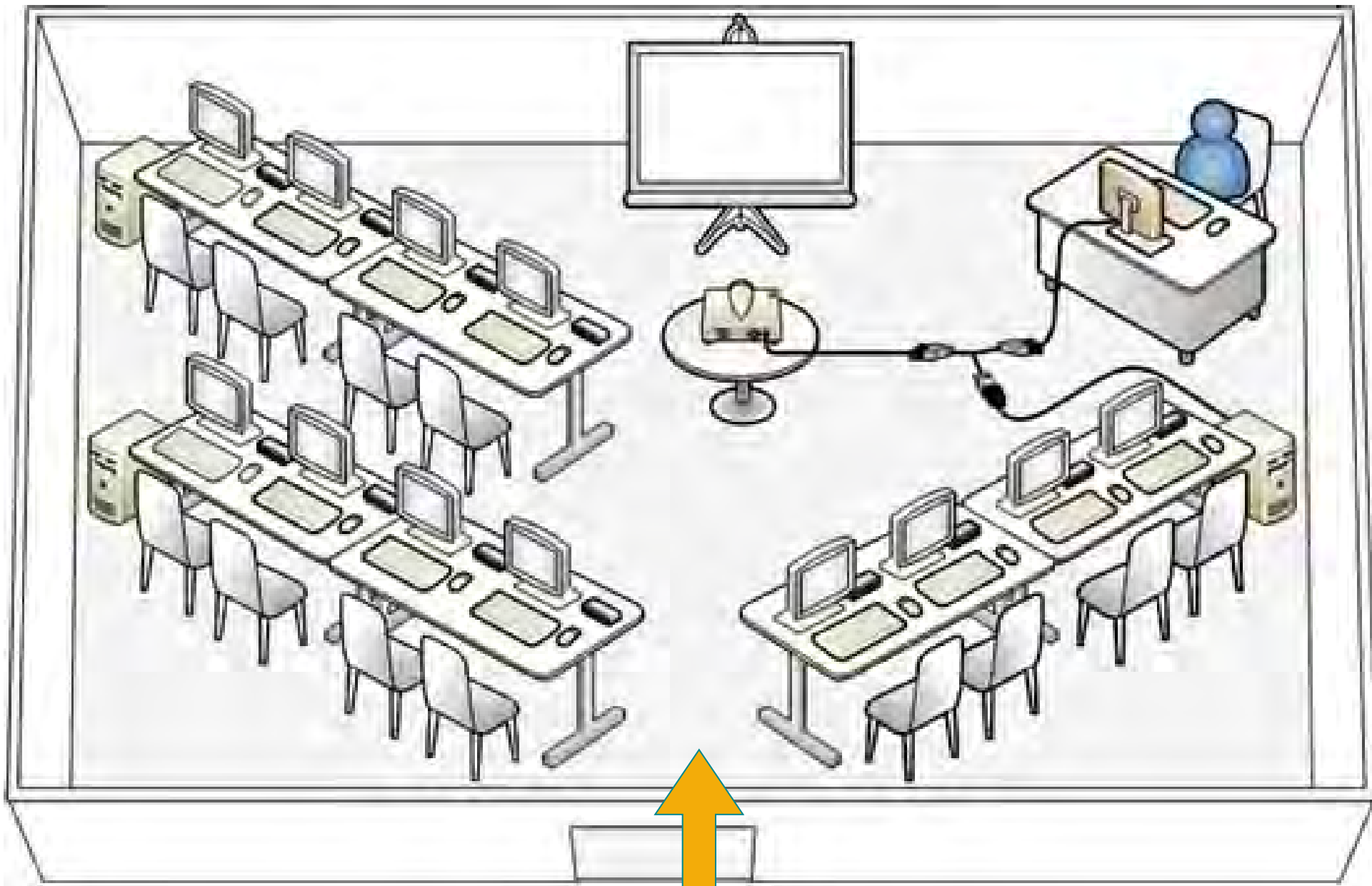
Build Trustworthy and Accessible AI

Develop privacy-preserving, interpretable, and locally deployable AI methods for educational settings. Synthetic data generation, model robustness, and small ("edge") AI to minimize cloud contact & cost.

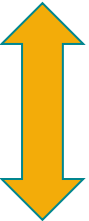
INVITE Learner Model



Vision for the Classroom



Learning & behavior over time



Two examples of inspiring applications of GenAI





Rylee Robles (She/Her) · 3rd

Aspiring Engineer and Storyteller

Los Alamitos, California, United States · [Contact info](#)

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 **Connect**

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Los Alamitos High School

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Rylee Robles · 3rd+

Aspiring Engineer and Storyteller

1mo · 

Thank you, [Ed Hidalgo](#), for the opportunity to speak with you and continue my journey with RIASEC!

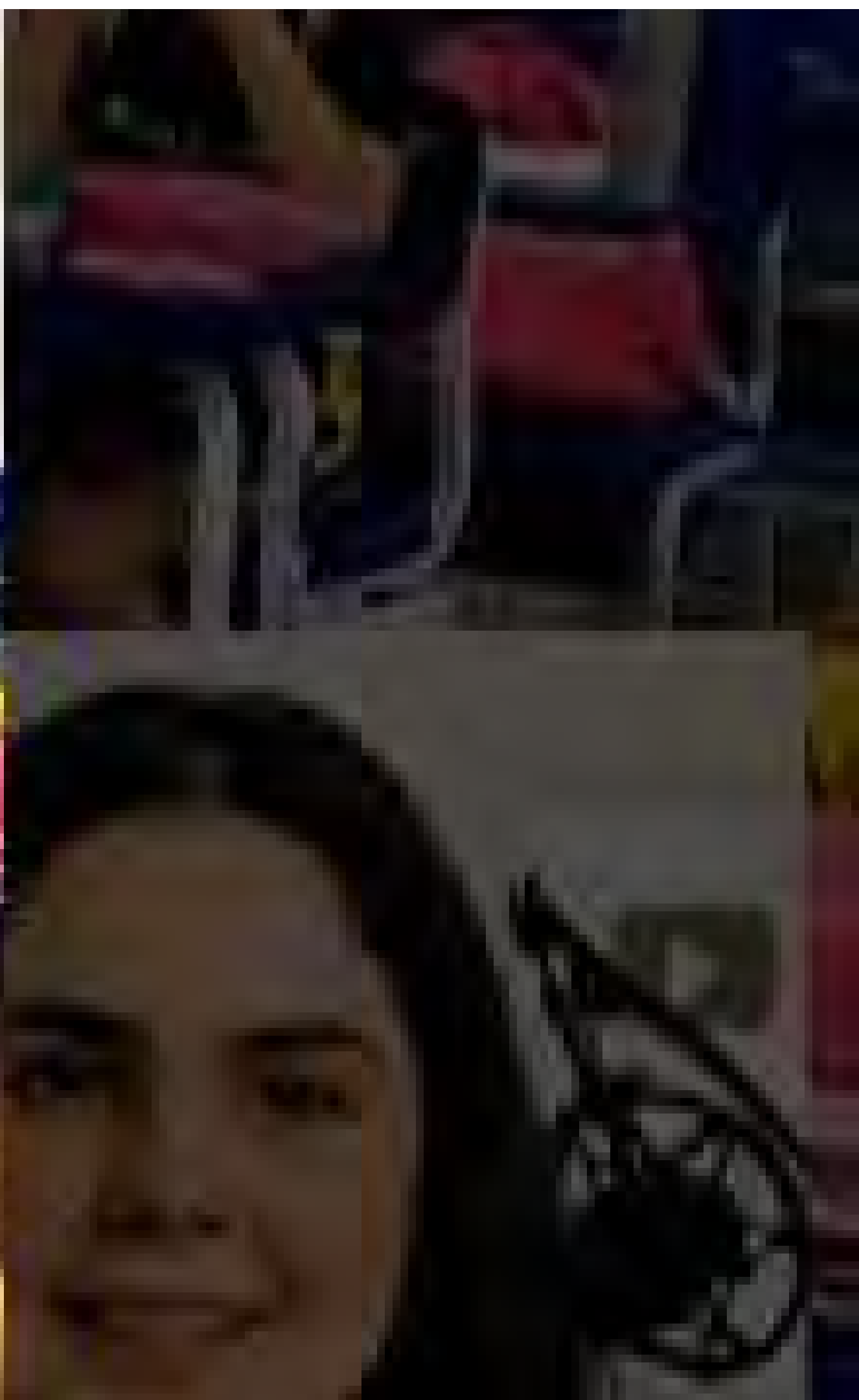
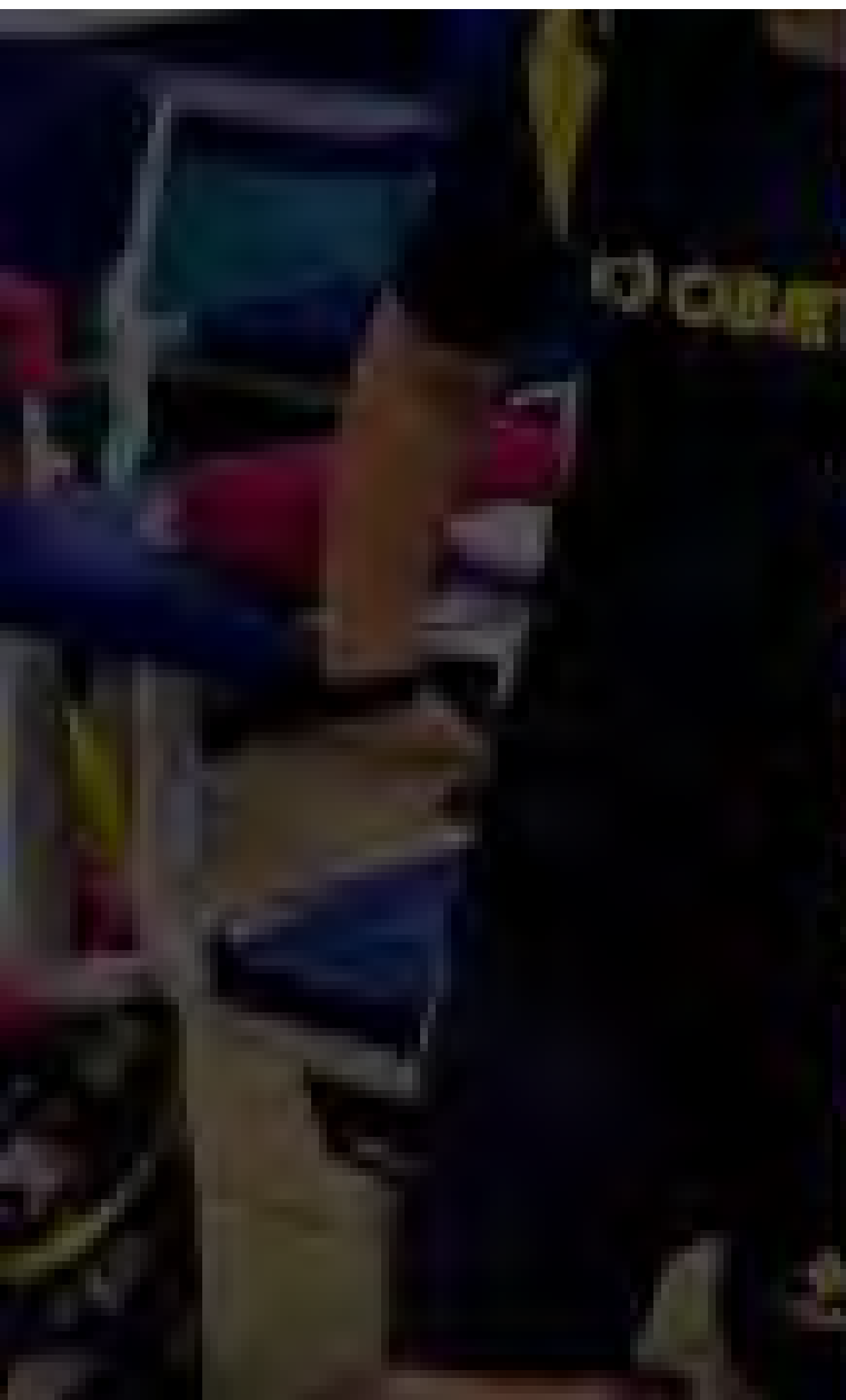


Rylee Robles · 3rd+

Aspiring Engineer and Storyteller

3mo · 

It was such an honor to present about RIASEC at the Future Leaders Conference! Thank you [OC Pathways](#) for this opportunity, and thank you [Ed Hidalgo](#) ...more



Recommended Resources

My position: To use GenAI tools effectively, knowing what happens under the hood is essential. [My recommendations.](#)

- Mark Riedl's "Intuition behind LLMs" articles (2, 15 minute reads)
- YouTube: 3blue1brown Neural Network Playlist (7 videos)
- Andrej Karpathy's intro videos on LLMs (~5hours total)

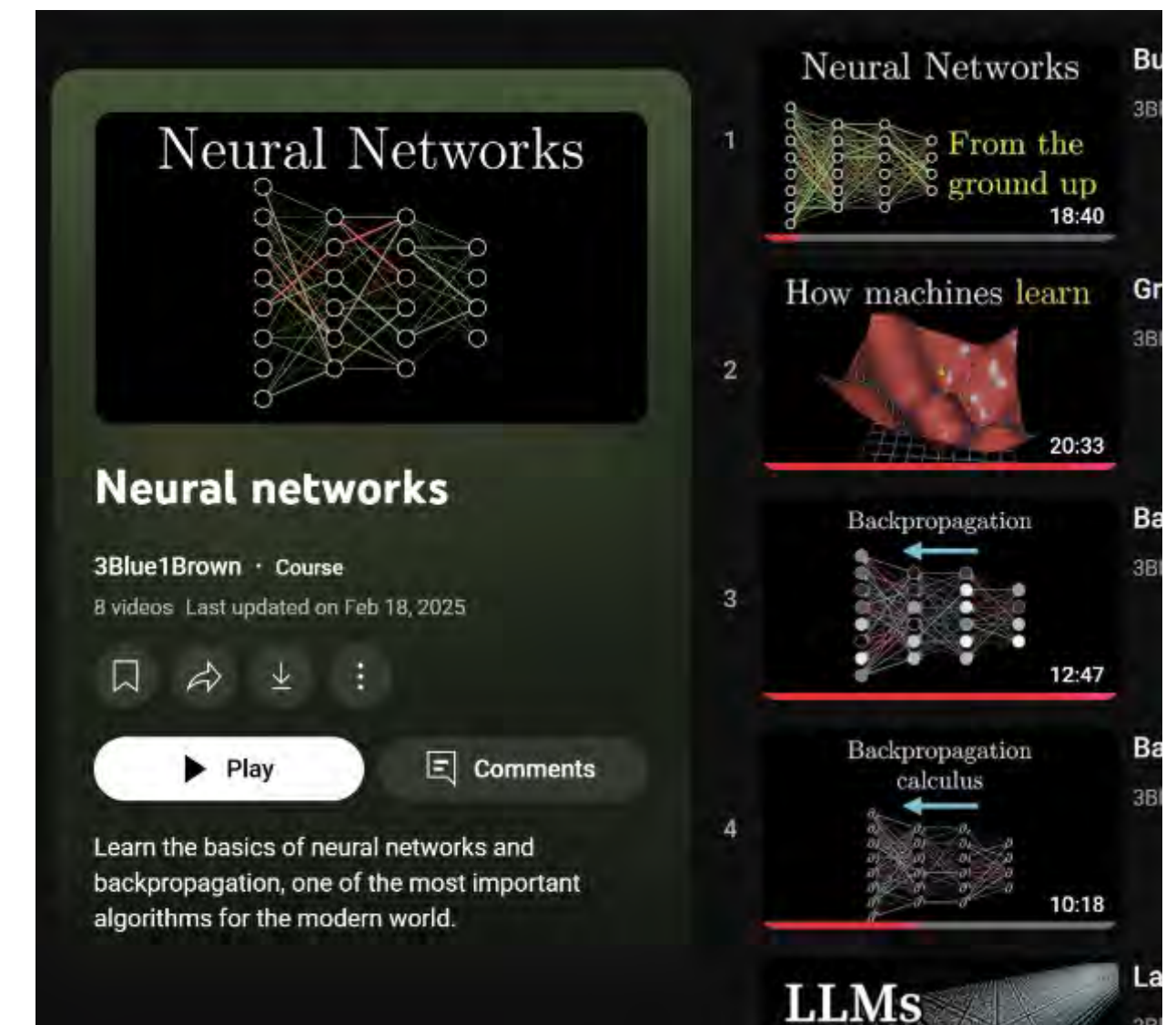
The Intuition Behind How Large Language Models Work, Part I

Mark Riedl [Follow](#) 13 min read · Aug 6, 2025

336 10



Large Language Models (LLMs) are fancy artificial neural networks. But you don't have time to learn the math or engineering. Unfortunately, a lot of primers will throw up diagrams like this:



(A few) recent developments



AI and the future of an MIT education

The premise: AI lets students skip the productive struggle that learning requires, and it is thinning the **social fabric** residential education depends on. The committee's answer is **redesign** of goals, assessments and community, rather than tighter policing of AI use.

1

What they found

AI use is pervasive and the effects are already visible. Problem sets, take-home exams, office hours, study groups and UROPs are all destabilized, isolation is rising, and student progress has become much harder to assess.

2

Eight principles

Be humble. Be bold. Put humanity front and center. Lean into learning. Teach with intentionality. No one size fits all. Augmentation not automation. Think beyond the classroom and the campus.

3

In the classroom

Start from course goals rather than from an AI rule. Shift toward oral exams, portfolios and in-class conversation. Build a required in-person social component into every subject. Publish an AI policy with its rationale. Skip the detectors, which misfire and corrode trust.

4

Institutional work

A standing committee, AI Leads in every school, funded AI Fellows and an implementation team, a pilot fund, and communities of practice for trading what works across groups. Model-agnostic platform, privacy/ logging rules, and attention to environmental cost.

"AI can allow students to bypass learning."

MIT Committee report (2026), §2.8

When capability is no longer scarce

TUMO Center for Creative Technologies, July 2026 | A strategy for nurturing authorship and connection through education

The premise: AI is turning capability into a commodity. What becomes scarce instead is **authorship**, the part of the work that is recognizably yours, and **connection**, the belonging that used to come free with work that needed other people.

1

Where scarcity moves

The shift runs across three domains: making, thinking and learning. In each, the value moves from producing the work to deciding what is worth making, judging whether the output holds up, and standing behind it.

2

Ten human powers

Presence (reflection, depth).
Agency (voice, initiative, perseverance). Command (knowledge, knowhow, reasoning).
Trust (responsibility, sharing).
Independent by design, and deliberately not combined into a single score.

3

Designing occasions

Scarcity used to supply the reasons to persevere, decide, wait and rely on others. Six principles restore those occasions: alternate solo and shared work, design for autonomy, protect time with nothing due, ground learning in inquiry, make struggle safe, treat learners as capable creators.

4

School and evidence

School gains importance as the guarantor of those occasions. The fork is a school of occasions or a school of delivery, built from identical tools.

Assessment stages the shortcut rather than removing it, and measures the program, not the learner.

"AI can teach you what you don't need to learn."

Claude for Teachers: launch, pushback, correction

Anthropic K-12 rollout | July 14 to August 28, 2026

The arc: A **direct-to-teacher** launch collided with how student data law actually works. Six weeks later the offering was rebuilt around the **district** as the party that holds the terms and carries the legal obligation.

1

July 14: the launch

Free premium Claude for verified US K-12 educators. Teaching skills grounded in learning science, a connector to academic standards in all 50 states, and K-12 terms barring model training on teacher inputs. Sold directly to individual teachers.

2

The pushback

Privacy specialists countered that FERPA obligates districts, not vendors, so no company can self-certify compliance and a teacher can rarely consent to share student data. Critics also faulted the direct-to-teacher route for bypassing district vetting.

3

August 28: the fix

The product opened to schools and districts as a free managed offering. The district now holds the K-12 terms and the data privacy agreement. Admins verify the organization, claim the domain, set SSO and role-based access, and absorb already-verified teachers.

4

What it settles

Real but partial. Still educator-only, with no student accounts. District terms supply visibility, not a local data-governance policy. Connectors need separate approval, and teachers on unclaimed domains remain outside district oversight.

FERPA obligates districts, not vendors. A teacher cannot consent on the district's behalf.

Anthropic; Education Week; Govtech

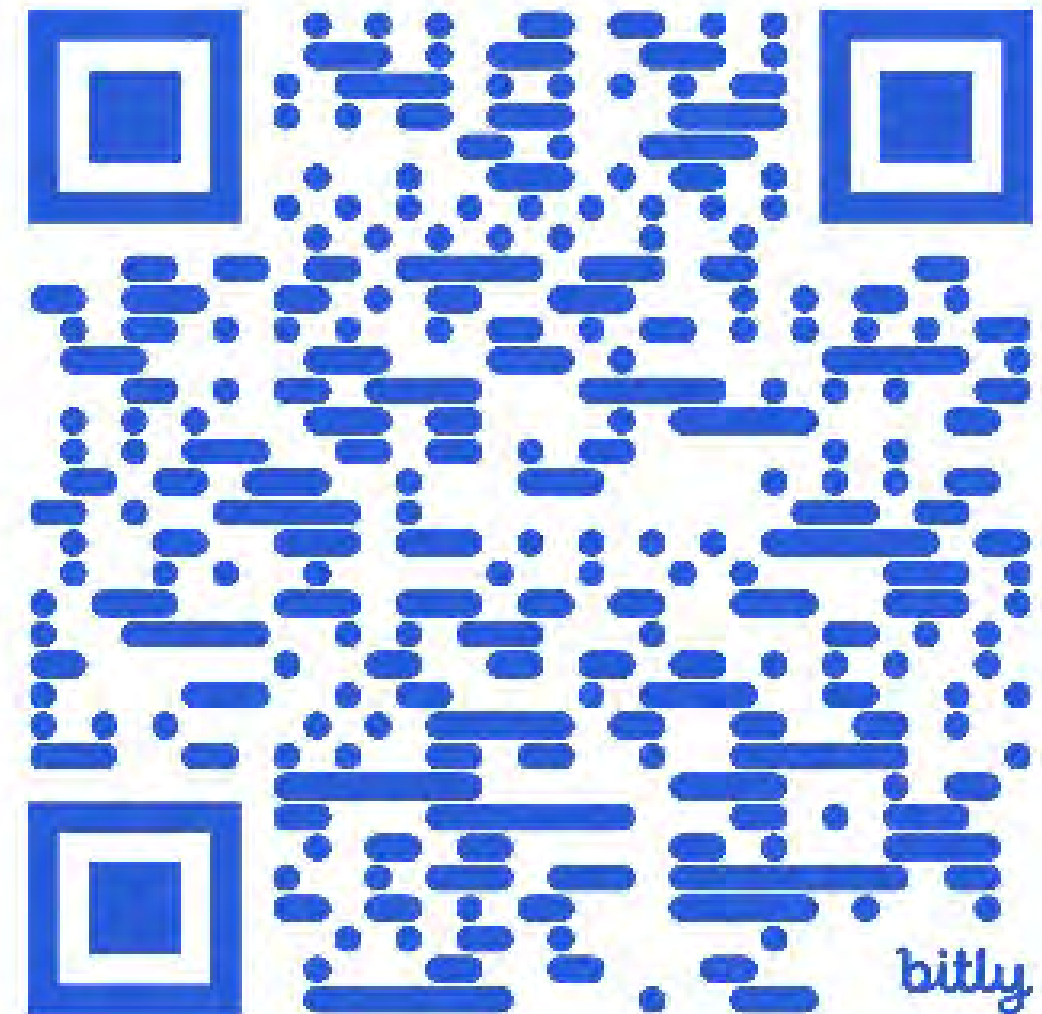
Where this leaves us

- **AI is already in the room.** ~6 in 10 teachers use it; 86% of kids have. The question is under what rules; 82% of teachers have had no training.
- **The risk isn't cheating, it's the bypass.** Struggle, failure, and impasse are where learning happens. GenAI makes skipping them free and invisible.
- **"AI in education" is three policy problems.** Teaching with AI, teaching about AI, and everyday AI use need different answers.
- **Build for the inner loop.** Systems that support thinking: hints, feedback, productive struggle *always* beat systems that hand over the answer.
- **Local AI is the underrated opportunity.** Small models on district hardware are capable, keep student data in the building, cut recurring cost, and work without reliable broadband.

Policy should always center human learning and support educators and researchers to redesign.

Event Survey—your feedback is important!

- Please take 3 minutes to complete our event survey.
- The survey also includes the option to share your contact info to receive our free resources.
- <https://bit.ly/4d21YLt>



Additional slides

What if teachers had an army?

Artificial intelligence has the same potential to revolutionize education by enhancing teachers' capabilities and enabling them to tailor learning paths to individual students in ways we never thought possible. This potential for transformation is amplified when A.I. is integrated with digital education, giving it real-time access to rich data on how students are learning.

It's natural to worry about change. The unknown often feels like a threat. But history has taught us an undeniable lesson: Instinctually building walls to protect ourselves only delays the inevitable. Those walls will be climbed, and they will fall. Adaptability, not defense, is the greatest skill we can have to stay relevant in a constantly evolving world. For teachers like me, this means dismissing doomsday predictions and reframing our mindset: A.I. isn't here to replace us; if used responsibly, it's here to help us become "superteachers."

- Anant Agarwal, "How AI Can Revive a Love of Learning, NYT Dec 7, 2024.



Project Keating: A Conversational Interface for Understanding Student Data

- Teacher-AI *Partnership* with teacher agency/control
- Complementary strengths
- Teacher guides local AI behaviors for each student
- Privacy protections, *runs locally at school or district*
- Support for preparing for Parent-Teacher Conferences

Ms. Rodriguez: "Good morning Keating, what do I need to know today?"

Keating: "Good morning! Yesterday was generally productive - 80% of students completed their functions practice exercises. The main challenge was nested loops - six students struggled with this concept, particularly in the robot maze activity. Also Devon struggled with his assignments yesterday for the first time in a while."

Ms. Rodriguez: "Tell me more about the nested loops issue."

Keating: "The students mainly struggled with the initialization of the inner loop counter. Maya and James wrote loops that didn't reset properly, while others had infinite loop issues. I can suggest some targeted warm-up exercises to address this."

Ms. Rodriguez: "Yes, please show me those."

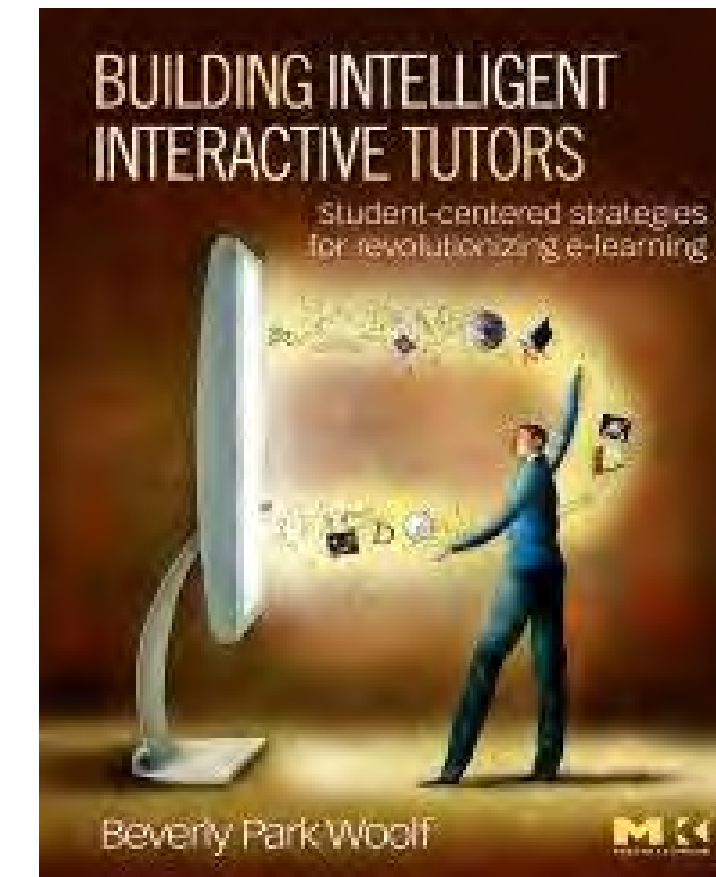
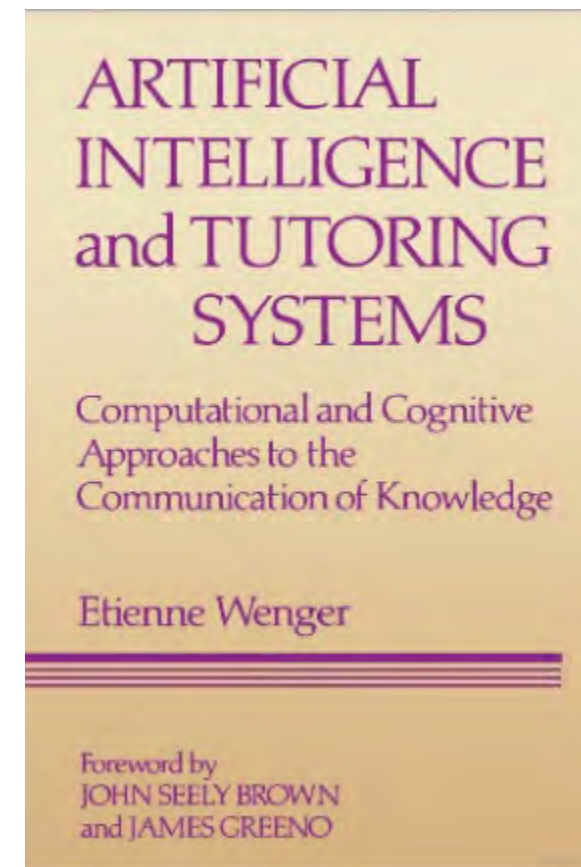
Keating: "Here are three short exercises in increasing difficulty... [appears on screen]"

Ms. Rodriguez: "These look good. And what's going on with Devon?" [....]

50+ years of AIED

IAIED

International AIED Society
<https://iaied.org/>



34 Tutorial dialogues: from semantic nets to mental models

SCHOLAR: Approx what is the area of Brazil?

Student: 2,500,000 square miles.

SCHOLAR: Wrong. Please indicate if the following statement is correct: the area of Paraguay is approx 47,432 square miles.

Student: What is the area of Brazil?

SCHOLAR: The area of Brazil is approx 3,600,000 square miles. Now answer the question you didn't answer before.

Student: False.

SCHOLAR: Rephrase your statement. I can't understand it.

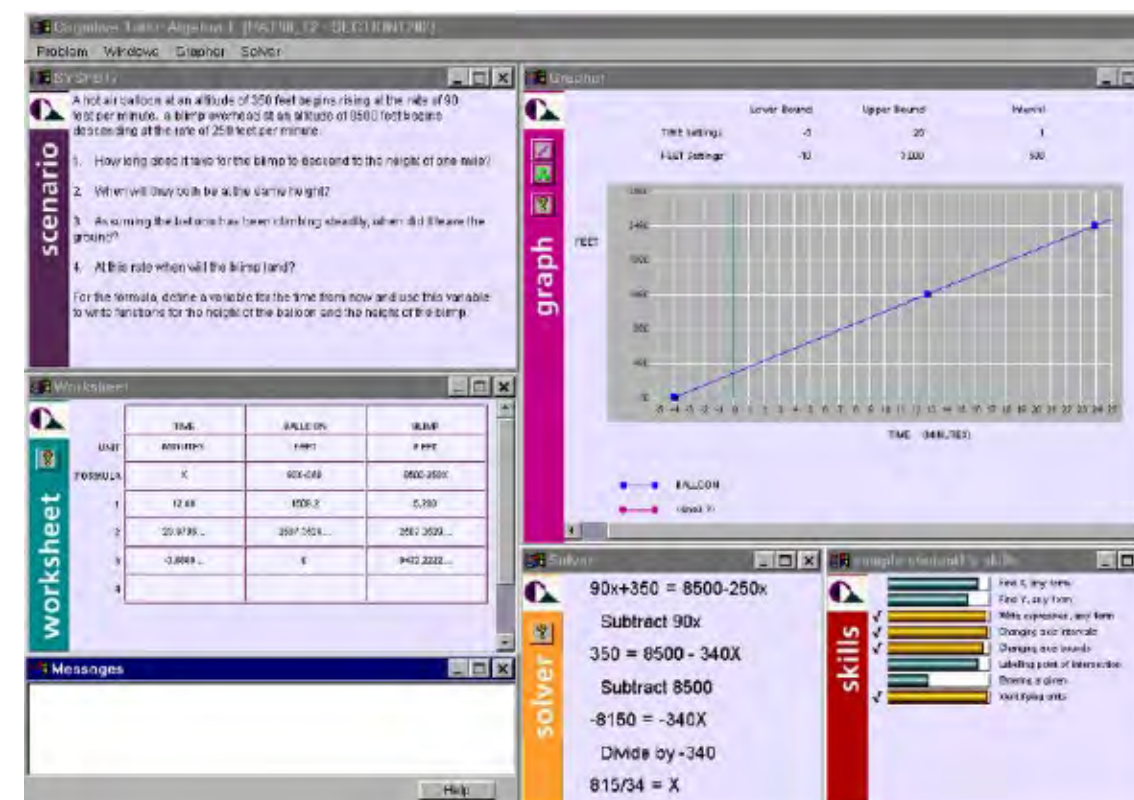
Student: Incorrect.

SCHOLAR: Very good. The area of Paraguay is approx 157,000 square miles. The language in Brazil is French. Right or wrong?

Student: Wrong.

SCHOLAR: You are correct. The language in Brazil is Portuguese. Is it true that the capital in Brazil is Brazilia?

Student: Yes.

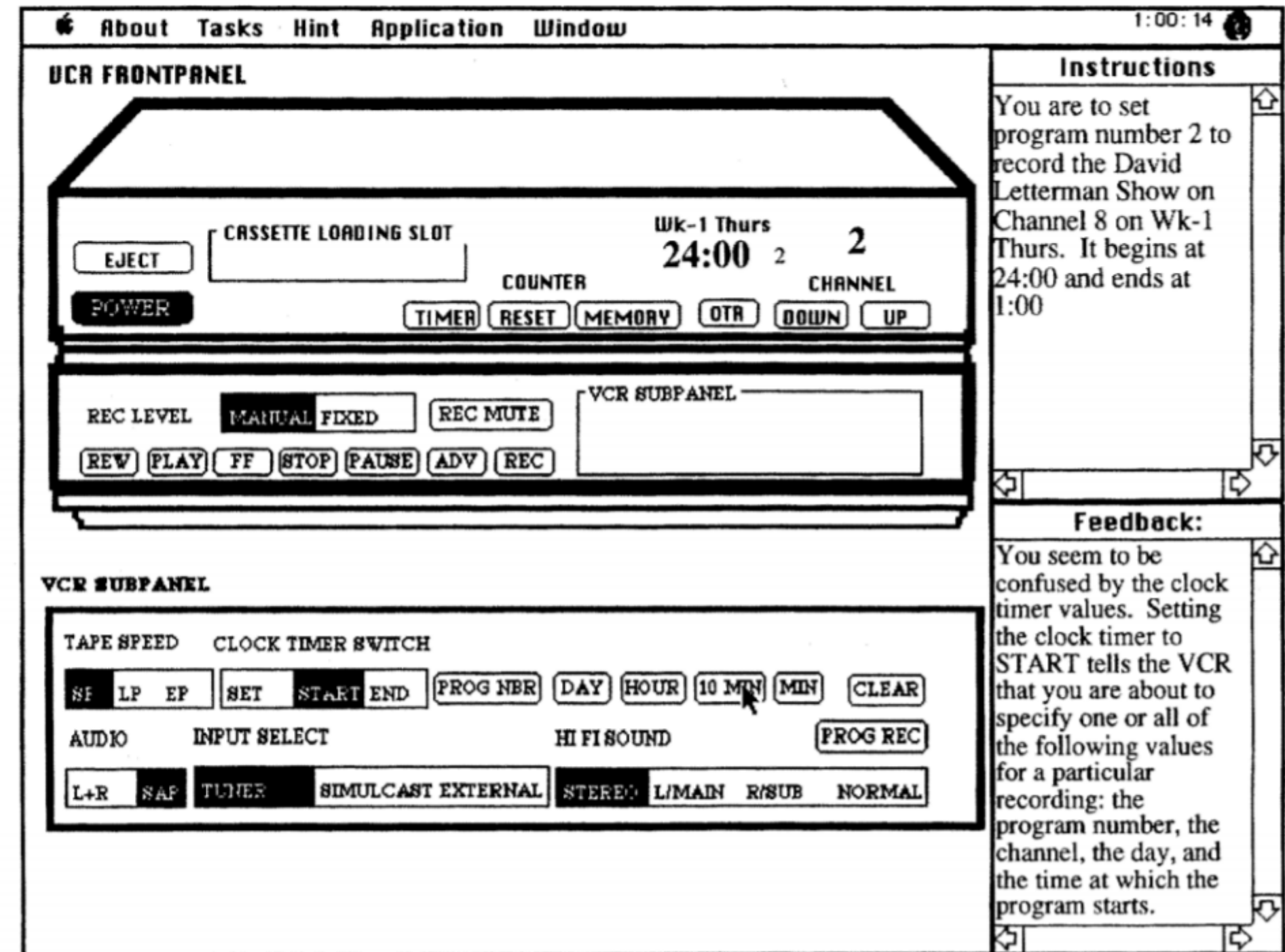




RQ: is knowlegable disagnosis & fbk beneficial over less knowledge-intensive techniques?

Task: setting a VCR to record a program

80 novice adults randomly assigned to one of four tutors...



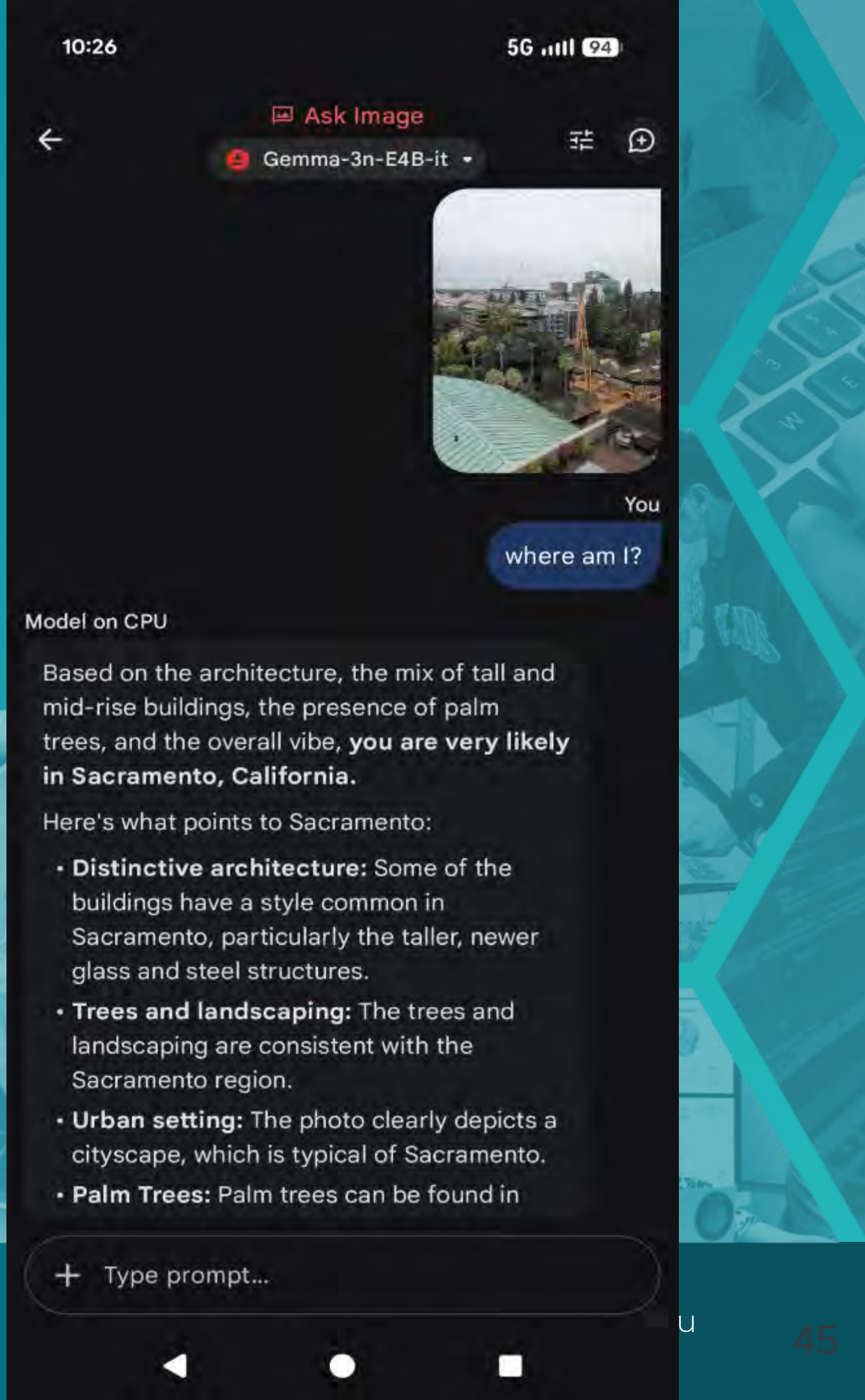
	Mark-I Prompting	Mark-II Sequence-based	Mark-III Device-based	Mark-IV Knowledgeable
Instructional Method	Prompting	Practice with feedback	Practice with feedback	Practice with feedback
Underlying Representation	Rigid model tracing	Rigid model tracing	Flexible model tracing	Flexible model tracing
Knowledge Implicitly Available	Procedural	Procedural	Procedural Conceptual	Procedural Conceptual
Knowledge Explicitly Presented	Procedural instruction	Procedural instruction	Procedural instruction	Knowledgeable instruction

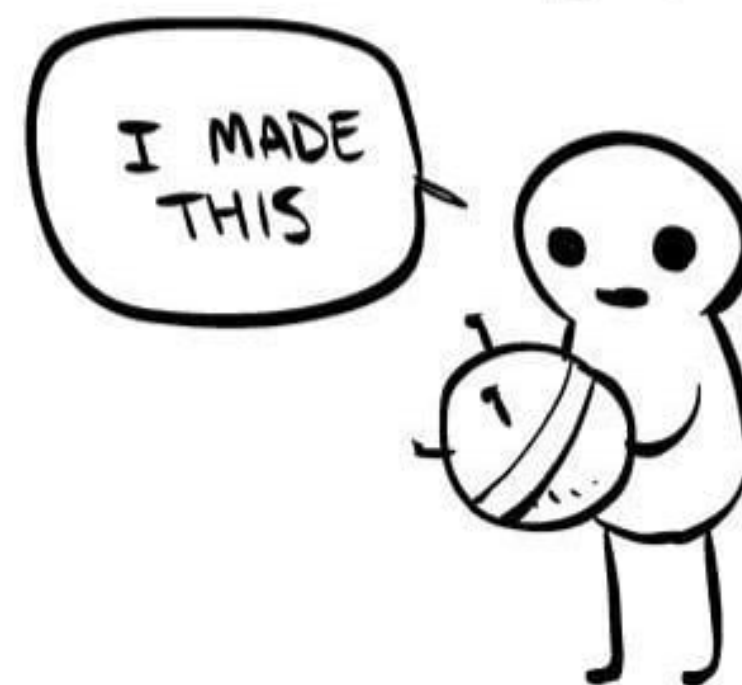
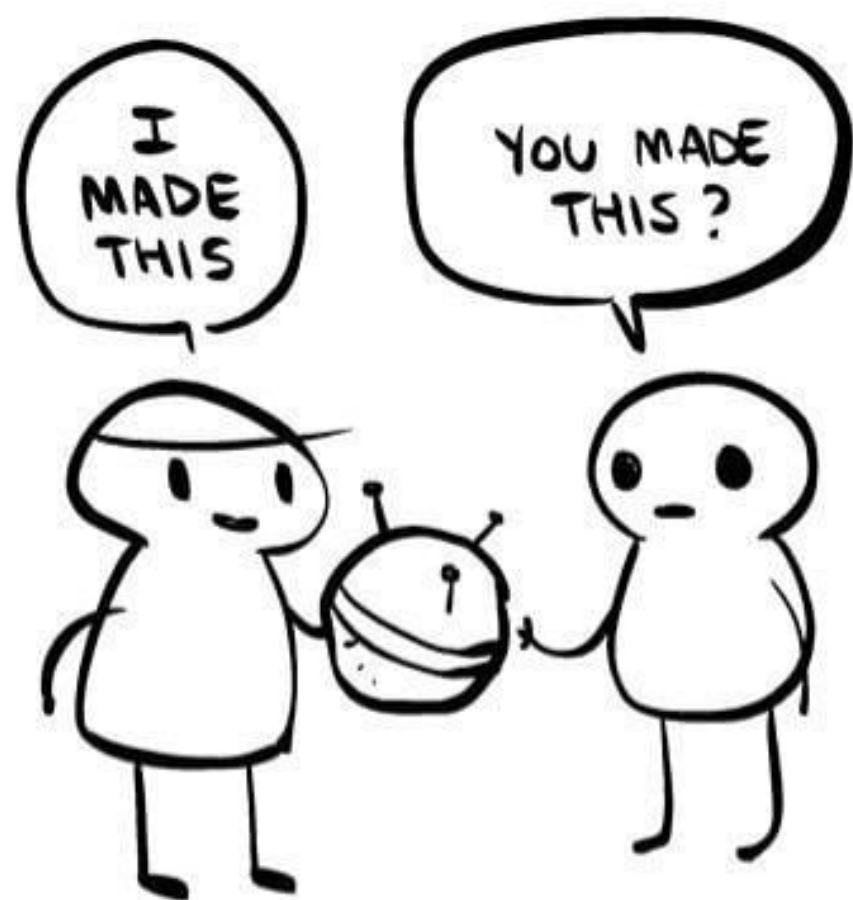


- Fbk emphasizes “underlying qualities & relationships”
- Based on conceptual model of device
- Slips are detected
- Individualized: system keeps a learner model
- identifies missing/inaccurate knowledge + remediates (buggy knowledge)

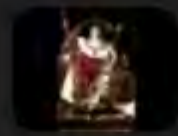
FIGURE 2 Versions of the VCR tutor.

Hands on!





They Might Be Giants!



James K. Polk

Song by They Might Be Giants · 1996

Lyrics

In 1844, the Democrats were split
The three nominees for the presidential candidate
Were Martin Van Buren
A former president
And an abolitionist
James Buchanan, a moderate
Lewis Cass, a general and expansionist
From Nashville came a dark horse riding up
He was James K. Polk, Napoleon of the Stump

Austere, severe, he held few people dear
His oratory filled his foes with fear
The factions soon agreed
He's just the man we need
To bring about victory
Fulfill our manifest destiny
And annex the land the Mexicans command
And when the poll was cast, the winner was
Mister James K. Polk, Napoleon of the Stump

In four short years he met his every goal
He seized the whole southwest from Mexico
Made sure the tariffs fell



PALEONTOLOGIST



Before we could just play those songs... but now!

The screenshot displays the SUNO app interface. On the left is a dark sidebar with navigation options: Home, Create, Studio, Library, Search, Hooks (+ Create), Explore, Radio, Notifications, 2,460 Credits, Upgrade, Earn Credits, What's new? (20), and More from Suno. The main content area features a song titled "Brain Power Jam" by "MesmerisingJazzcore2249". The song's cover art shows a brain with musical notes. The description reads: "sleep, electronic with clapping percussion and bright synths, playful". It includes an "Add a Caption" button and a timestamp "September 20, 2025 at 7:45 AM v4.5+". Below the title are interaction buttons: play (14), comment, like (1), dislike, and a menu. To the right are buttons for adding, sharing, and playing. The lyrics are displayed in two sections: [Verse] and [Prechorus]. The [Verse] lyrics are: "Up in your head it's a crazy scene", "The brain's got zones like a working machine", "Cerebrum's the boss", "Where the thinking's done", "Reasoning", "Language", "Solving for fun". The [Prechorus] lyrics are: "Cerebellum's got the groove", "Keeps you balanced", "Keeps you smooth". Below the lyrics is a comment section with a row of reaction emojis (fire, smile, party, clapping, thumbs up, thumbs down, surprised) and a "Write a comment" input field. The comment section currently displays "No comments yet!". At the bottom is a music player bar showing the song title, artist, and a progress bar from 00:00 to 02:09. A small text "Use it every hour" is visible at the very bottom left.

SUNO

MesmerisingJazzcore2249

Home
Create
Studio
Library
Search
Hooks + Create
Explore
Radio
Notifications
2,460 Credits
Upgrade
Earn Credits
What's new? 20
More from Suno

Brain Power Jam

MesmerisingJazzcore2249

sleep, electronic with clapping percussion and bright synths, playful

Add a Caption

September 20, 2025 at 7:45 AM v4.5+

14 1

+ Share Play

[Verse]
Up in your head it's a crazy scene
The brain's got zones like a working machine
Cerebrum's the boss
Where the thinking's done
Reasoning
Language
Solving for fun

[Prechorus]
Cerebellum's got the groove
Keeps you balanced
Keeps you smooth

Write a comment

No comments yet!

Brain Power Jam
MesmerisingJazzcore22 | 00:00 / 02:09

Use it every hour

Sesame - Meet Myles



Sesame

Research

Team

Preview

Join the Beta

Bringing the computer to life

We believe in a future where computers are lifelike. They will see, hear, and collaborate with us the way we're used to. A natural human voice is key to unlocking this future.

To start, we have two goals.

01

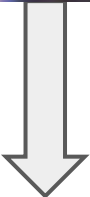
A personal agent

An ever-present brilliant friend and conversationalist, keeping you

Photo editing gemini.google.com/app

Gemini 2.0 Flash
(Image Generation) ▼
Experimental

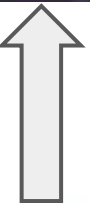
change those to be more colorful



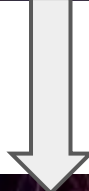
add another conure to
my other shoulder



give me flowing hair like an 80's hair metal guitarist



add sunglasses



change the background
to be a stage with lights



zoom out and show me on stage playing guitar

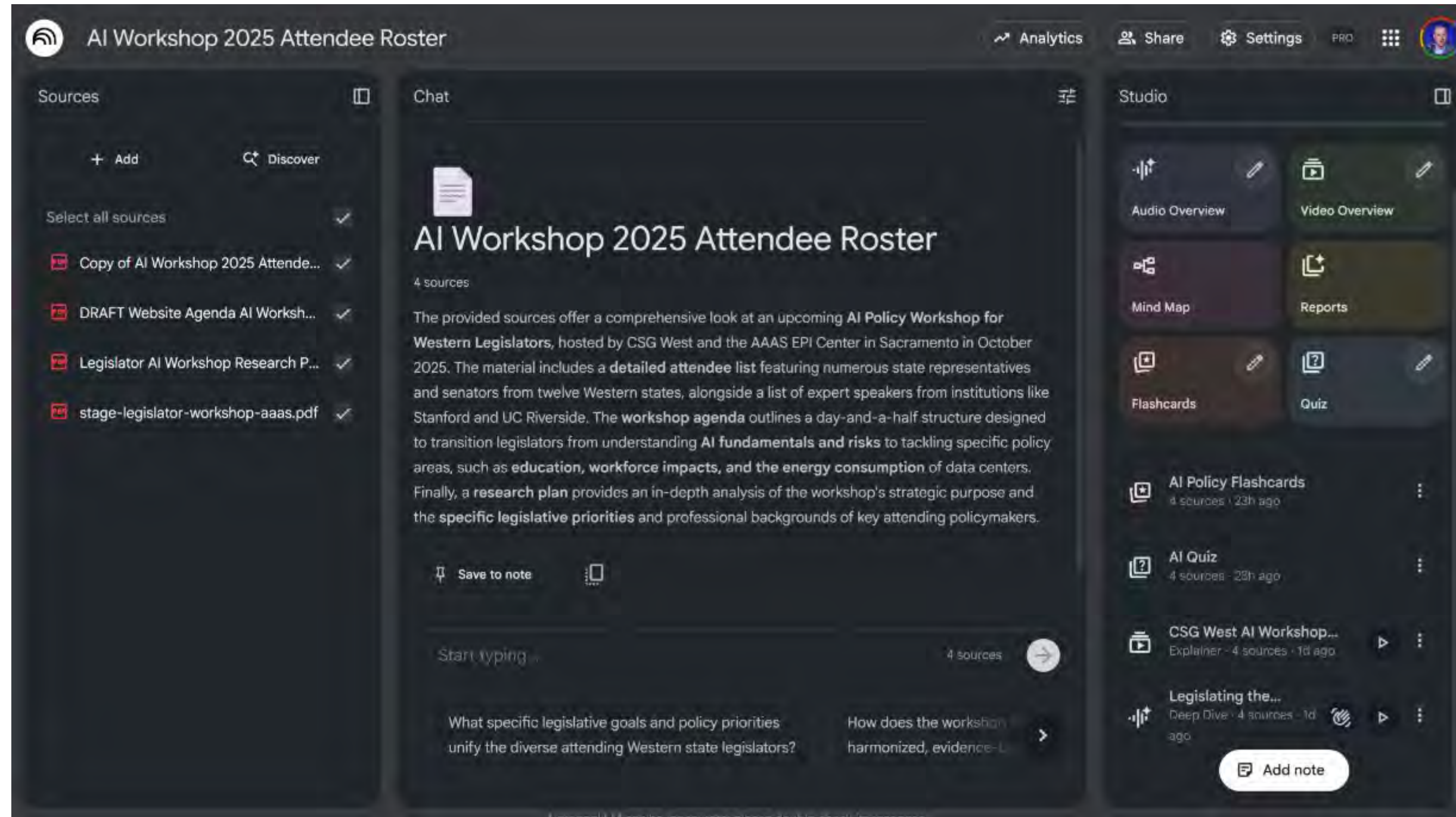
Lessons I've learned - “Advice”

- Talk to LLMs about things you know deeply - helps you identify your baseline.
- LLMs are useful thought partners; **they are by definition not knowledge bases**
- Creative tasks, like titles for papers or legislation (“Give me five titles”) tend to work very well for giving you ideas.
- Write long elaborate prompts. Fill that context window with relevant content!
- Have a look at *Projects* (Claude & ChatGPT have them). You can load up your context and prioritize critical documents for use (Search for “RAG” to understand)
- For you: ask for multiple viewpoints / perspectives: “Give me five different responses from distinct perspectives” to some legislation. Ask for ideas to address them / strategies for messaging.

Notebook LM (review it's work on you!)

To prepare, I:

1. Got attendee list (minimal details)
2. Used Gemini Deep Research to get a full report.
3. Uploaded list, report, agenda, and webpage to NotebookLM
4. Generated prep materials



NOTE: I will remove this slide before sharing publicly

Now your turn

1. Go to <https://notebooklm.google/>
2. Click “Try NotebookLM”
3. Create New Notebook
4. Upload the sources you have (only pdf, md, txt, and audio)
5. On the right, click on flashcards or quiz (or both)
 - a. will be fast - check them out below.
6. On the right, click on video overview - **Use pencil icon to customize**
 - a. review options (deep dive, debate, etc.)
 - b. enter a customization prompt - say what you are focused on, what perspective you need to take, what topics are most important... anything you can think of.
 - c. Pick your favorite style.
 - d. Generate - this will take a few minutes.

FOR MORE SEE:



Practical Uses of GenAI for Academics

H. Chad Lane

Professor of Educational Psychology & Computer Science

University of Illinois, Urbana-Champaign

<http://invite.illinois.edu> <http://hchadlane.net>

<http://whimc.org>

Director, NSF-IES INVITE AI Institute