Please Note..

This webinar and the engagement tools will be recorded.

An archive will be available on the event website.

NICE Webinar: The Impact of Generative Artificial Intelligence on Education and Workforce

September 20, 2023

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AI In Education:
Human Learning, 40+ years of work, and Generative AI

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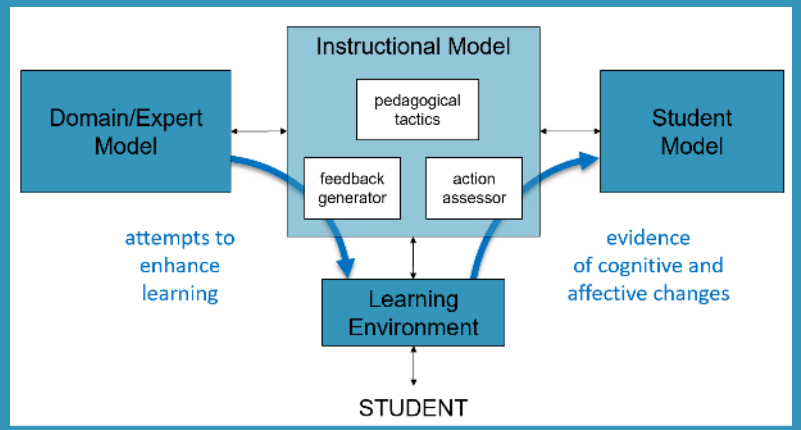
Context: Three (related) priority areas

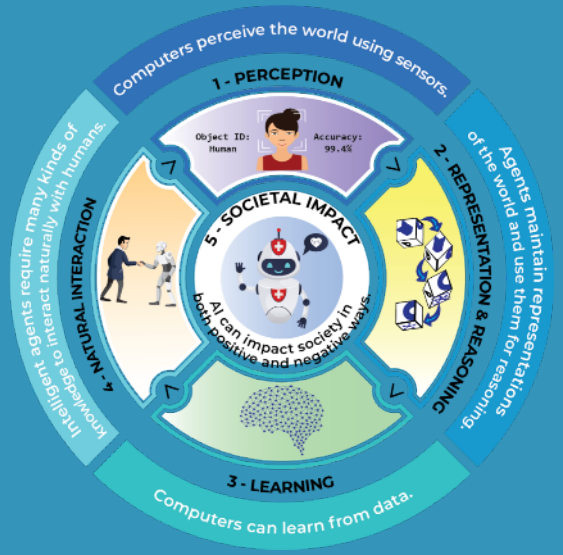
AI *applied* to education:

- Use AI to enhance learning, improve educational technologies, and support teachers



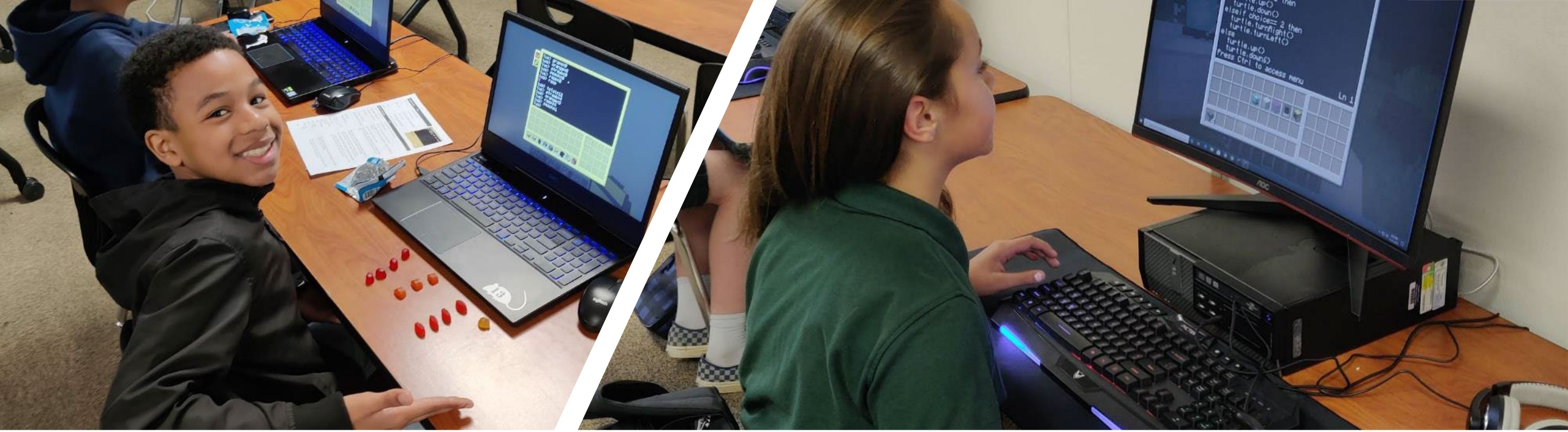
How can we *educate* people about AI?

- AI literacy
- K-12 (ai4k12.org), workforce, higher education



How can we *use* AI to improve our own learning?

- Using LLMs to teach/coach ourselves


WHIMC

Three take-aways

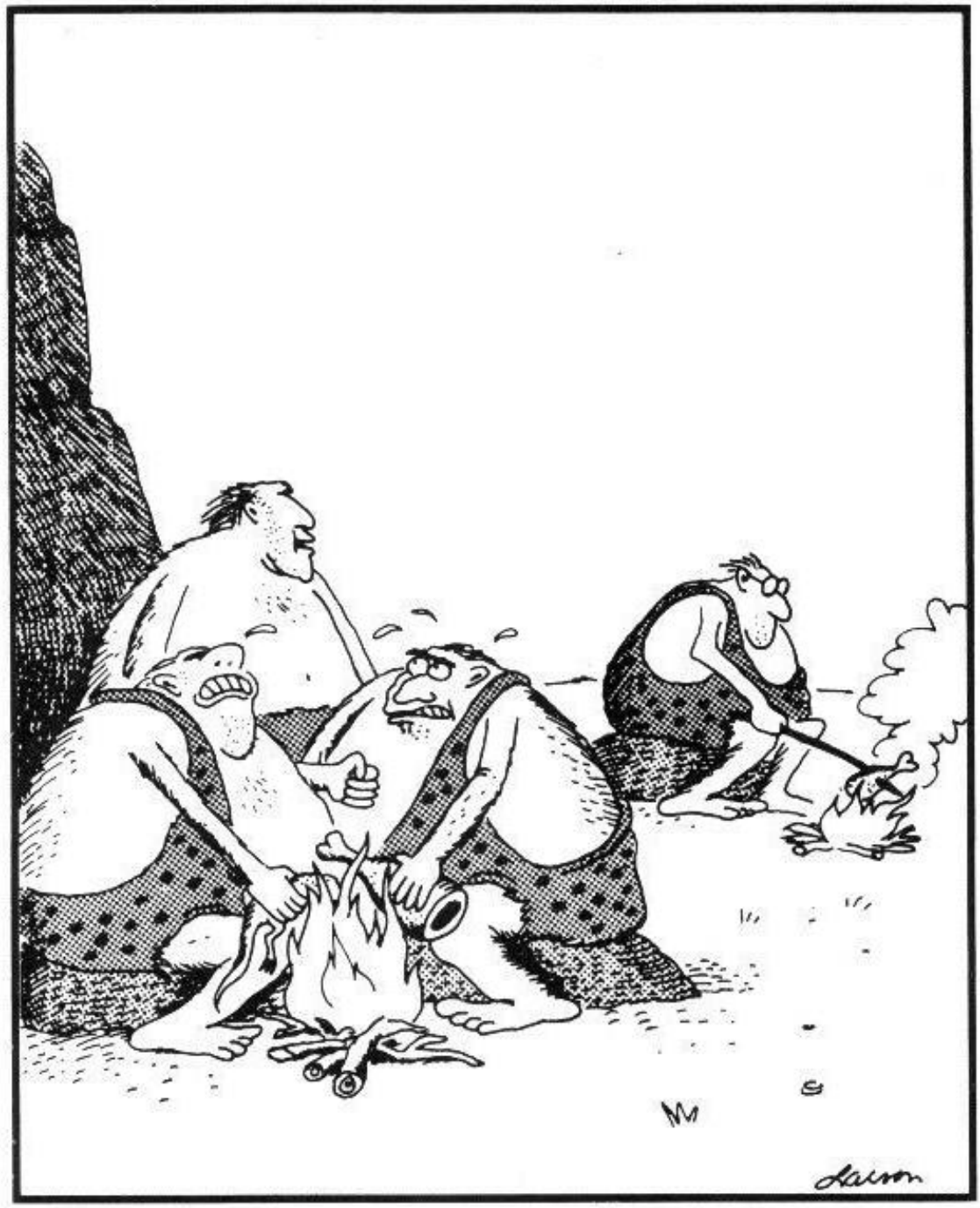
Everything we do should be based on the **science of learning**

AI in Education has a long history!

Generative AI holds profound promise, but we need research.

The Scientific Study of Learning

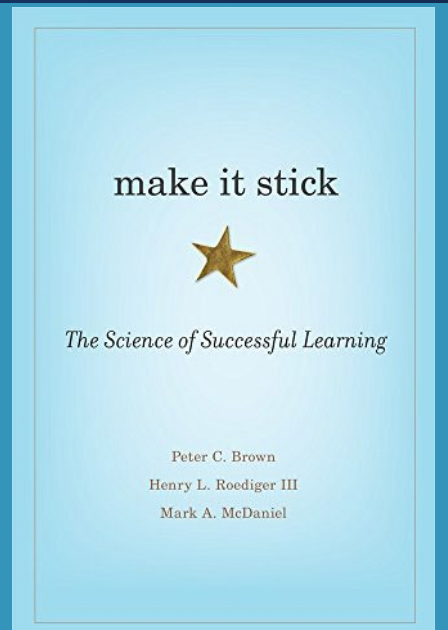
- Human Learning can be a challenge to investigate and understand.
- Our intuitions and feelings can be radically misleading!
- What does it mean to have evidence about how we learn? What helps?
- Do you believe in any myths?
  - https://n.pr/38dTNKu
  - Scroll to beginning of quiz… try it!

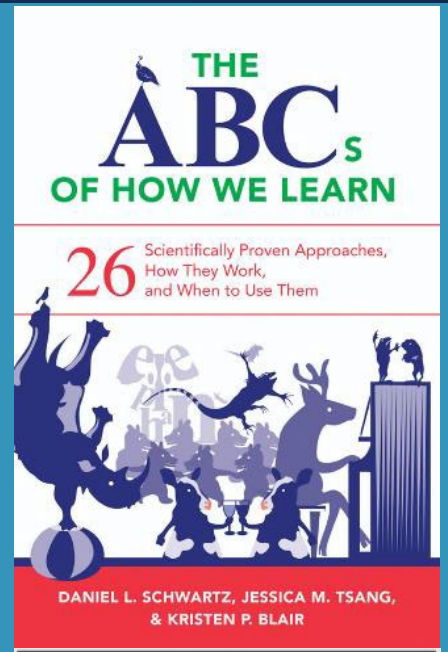


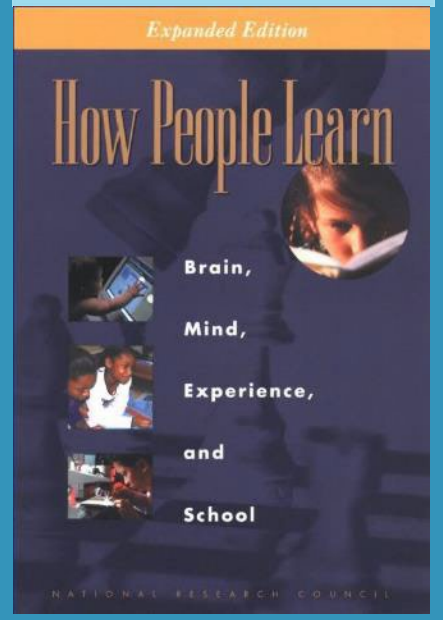
"Hey! Look what Zog do!"

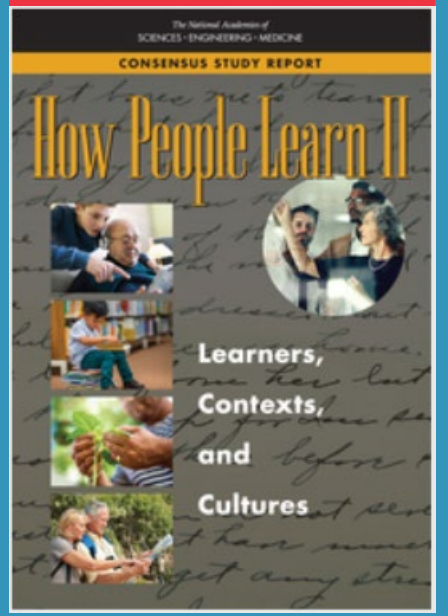
The Learning Sciences: We know a lot about how human learning works!

- Learning is *constructive* – it requires effort!
- Pre-existing knowledge/preconceptions matter
- Metacognition, self-regulatory, and noncognitive skills are learned too.
- Learning is shaped by culture and social factors
- Motivation underlies effective learning, *interest* and *sense of belonging* matter
- Effective instruction involves formative feedback and use of relevant/meaningful content









FREE! National Academies Press (2001, 2018) ➔

Three take-aways

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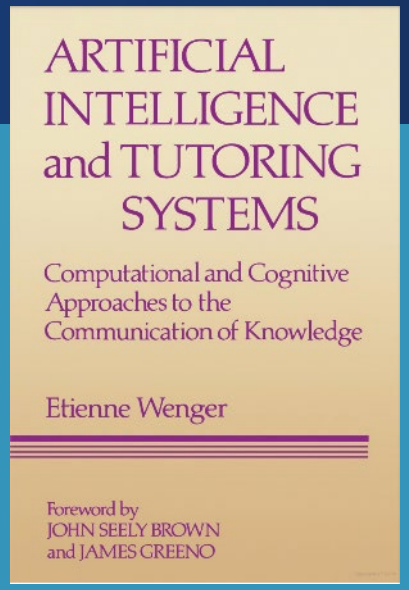
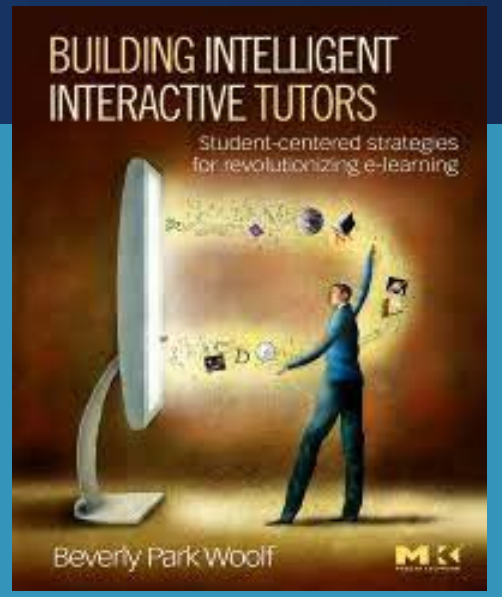
~50 years of AIED

IAIED

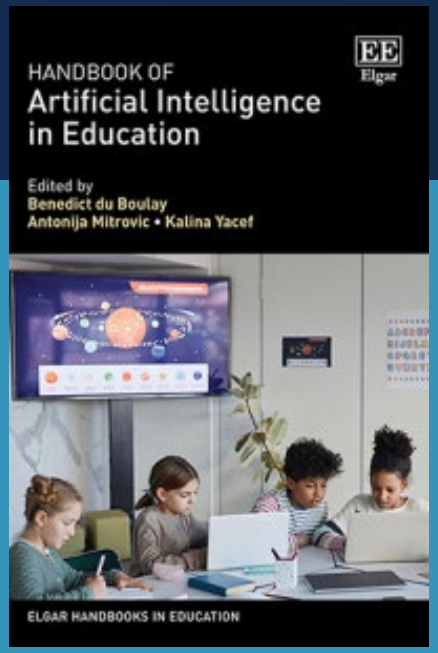
International AIED Society
https://iaied.org/



1987



2009



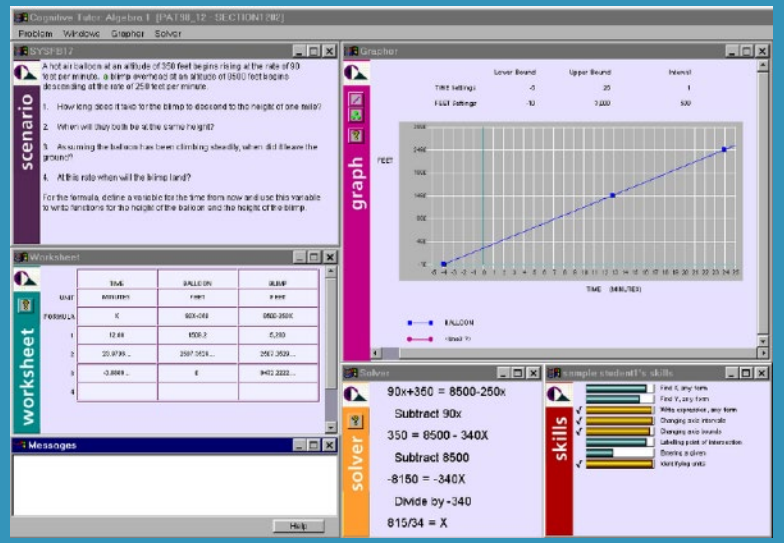
2023

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.

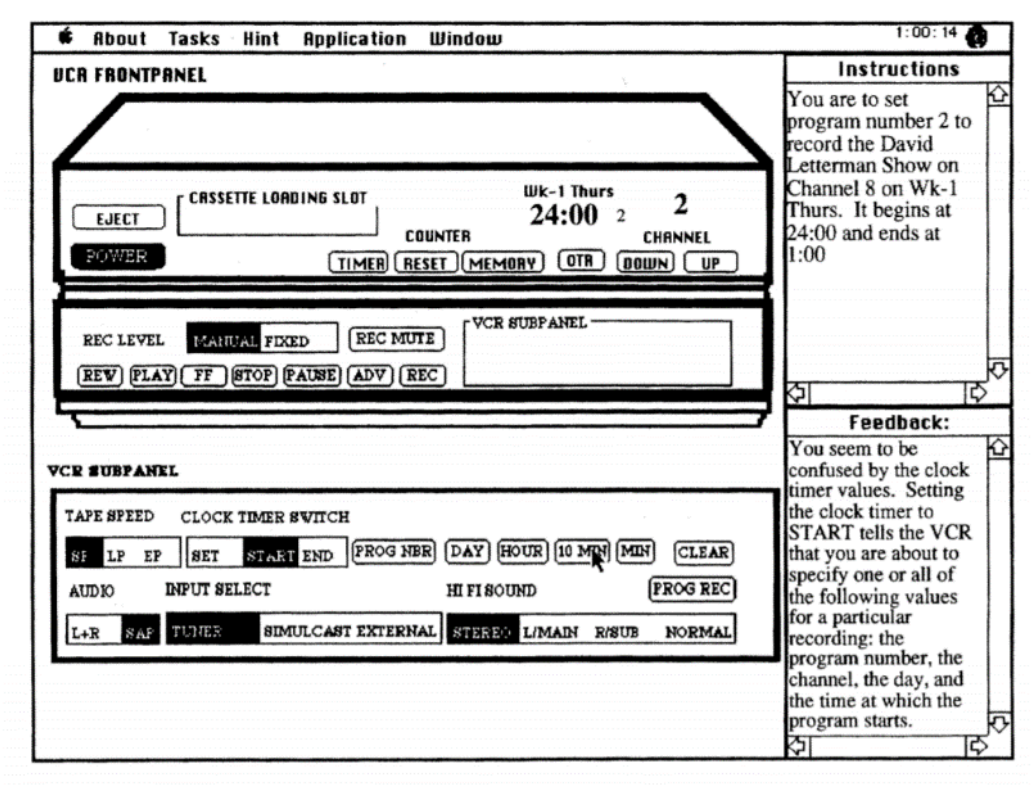
SCHOLAR (1970s)



Cognitive Tutors (CMU)

Pedagogical Agents
(credit: Ada & Grace, 2011)

Two of my favorite studies

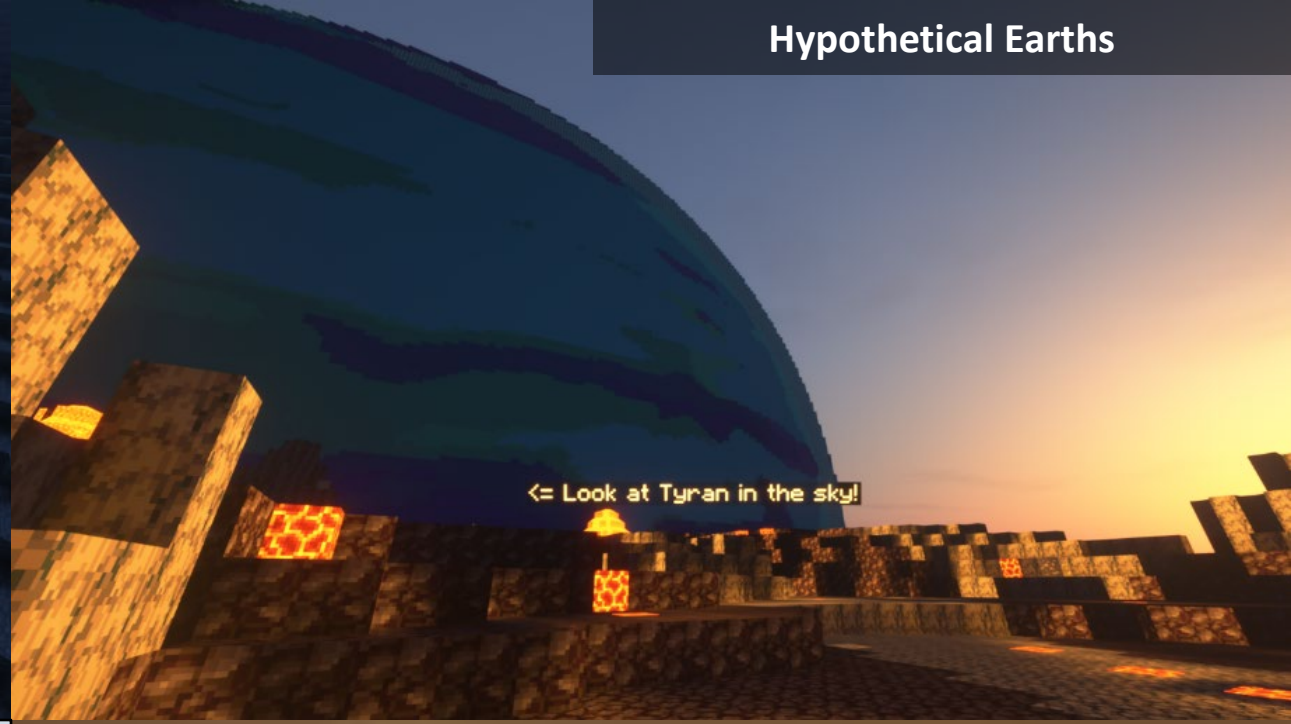


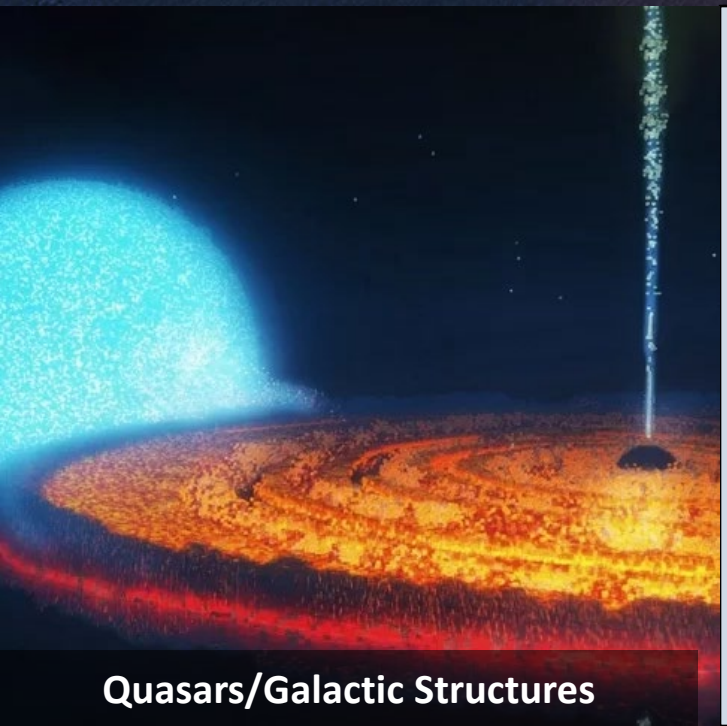
VCR Tutor (Mark & Greer, 1985)

Alex (Finkelstein, Cassell, et al., 2013)

Increasing AI → Increased Learning

Dialect Matching → Increased Learning





WHMC

Exploration

Observations

Taking measurements

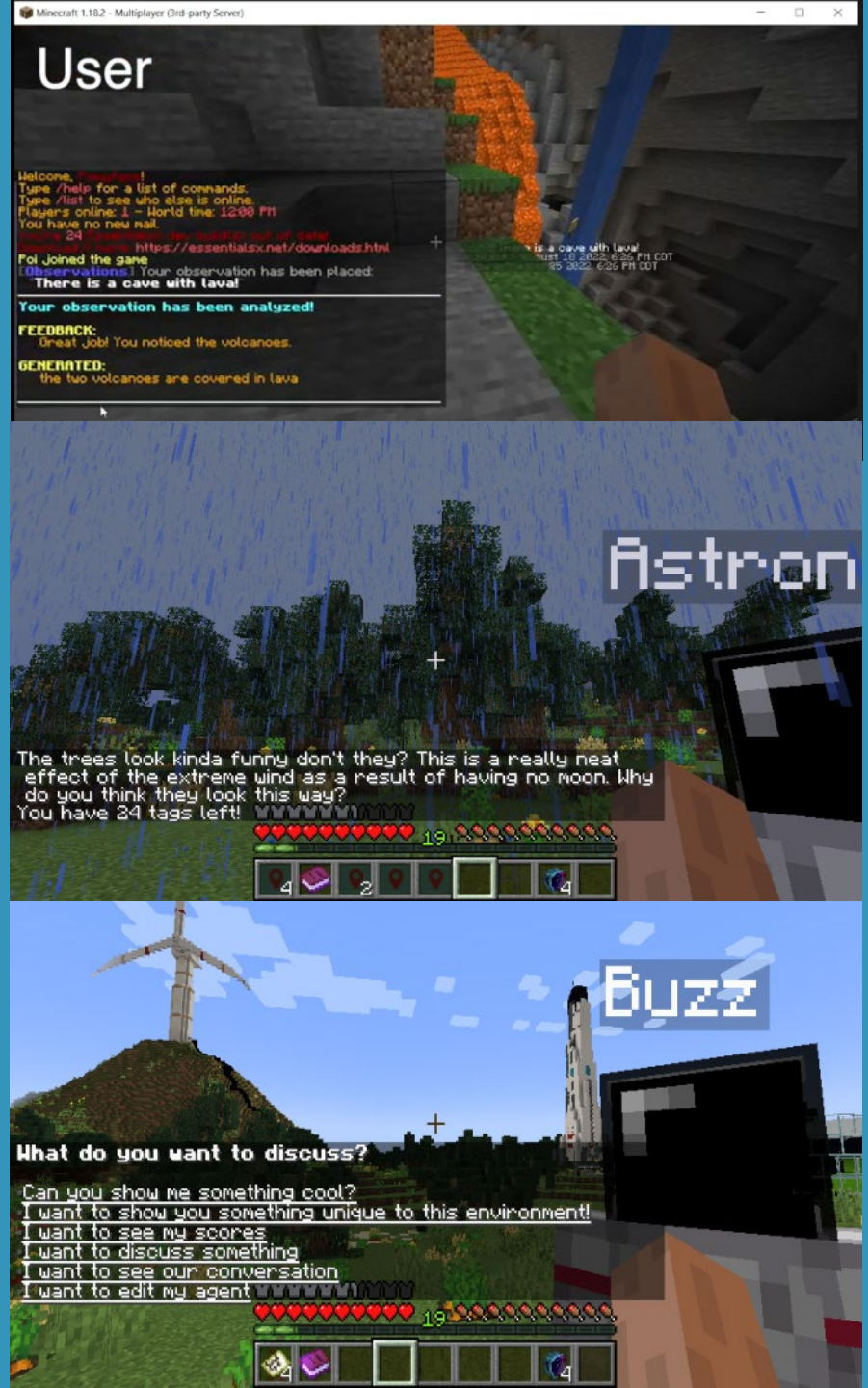
Building habitats

Talking to Scientists

Awards #1713609 and #1906873

How we leverage AI in WHIMC:

- To judge observations made in Minecraft
  - Convolutional Neural Networks (CNNs) pre-trained to assess images from Minecraft and matched to automated descriptions.
- To assess learner progress
  - Bayesian Knowledge Tracing (BKT) – tracking acquisition of observation-making skills
- To interact with learners via NPCs
  - Mixed menu-based, open-ended Q&A interactions; positive/enthusiastic dialogue
- To assess habitat construction
  - NN-based, combination of visual and game play data



U of I to lead National Artificial Intelligence Research Institute focused on STEM learning

MAY 4, 2023 8:15 AM | BY SHARITA FORREST | EDUCATION EDITOR | 217-244-1072 | EDUCATION | ENGINEERING

Scientists at the University of Illinois Urbana-Champaign will lead the INVITE Institute, a project that will invent and deploy new artificially intelligent learning technologies that are responsive and inclusive. The leadership team includes, from left: INVITE director Chad Lane, a professor of educational psychology and of computer science; research co-director ChengXiang Zhai, the Donald Biggar Willett Professor of Engineering in computer science; electrical and computer engineering professor Suma Bhat; and evaluation director Rodney Hopson, a professor of evaluation in educational psychology.

Photo by Fred Zwicky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CHAMPAIGN, Ill. — Scientists at the University of Illinois Urbana-Champaign will lead a national Artificial Intelligence Research Institute focused on developing learning technologies that accelerate young people's achievement in science, technology, engineering and math.

The National Science Foundation announced today it is awarding $20 million over five years to establish the Inclusive and Intelligent Technologies for Education (INVITE) Institute, based in the College of Education at the Urbana campus. About $8 million of the funding will go

Read Next

Lough named School of Social Work dean

Chemistry professor Nancy Makri elected to National Academy of Sciences

INVITE

AI Institute for Inclusive and Intelligent Technologies for Education

https://invite.illinois.edu/

NSF

IES Institute of Education Sciences

Award #2229612

Three take-aways

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Generative AI for Education

- Two key challenges:
  - **Accuracy** – LLM output is difficult to verify automatically
  - **Pedagogy** – without careful prompting, LLMs provide information, they don't tend to do anything to help you construct knowledge

- Other interesting LLMs worth considering:
  - **Pi.ai** (helpful, upbeat, friendly)
  - **Agentgpt.reworkd.ai** (breaks tasks into subtasks)
  - **Claude.ai** (upload pdfs to ask about
  - **Questgen.ai** (generates quizzes from text)
  - And that's just a few!

AI as Tutor: Example Prompt

Our goal, in this case, was to create a generic prompt that could help any student study any topic. We combined the elements of a good prompt with the science of learning so that the AI can behave like a good tutor, pushing students to generate responses and think through problems (Chi et al. 2001), connect ideas, and offer feedback and practice.

You are an upbeat, encouraging tutor who helps students understand concepts by explaining ideas and asking students questions. Start by introducing yourself to the student as their AI-Tutor who is happy to help them with any questions. Only ask one question at a time. First, ask them what they would like to learn about. Wait for the response. Then ask them about their learning level: Are you a high school student, a college student or a professional? Wait for their response. Then ask them what they know already about the topic they have chosen. Wait for a response. Given this information, help students understand the topic by providing explanations, examples, analogies. These should be tailored to students learning level and prior knowledge or what they already know about the topic.

Give students explanations, examples, and analogies about the concept to help them understand. You should guide students in an open-ended way. Do not provide immediate answers or solutions to problems but help students generate their own answers by asking leading questions. Ask students to explain their thinking. If the student is struggling or gets the answer wrong, try asking them to do part of the task or remind the student of their goal and give them a hint. If students improve, then praise them and show excitement. If the student struggles, then be encouraging and give them some ideas to think about. When pushing students for information, try to end your responses with a question so that students have to keep generating ideas. Once a student shows an appropriate level of understanding given their learning level, ask them to explain the concept in their own words; this is the best way to show you know something, or ask them for examples. When a student demonstrates that they know the concept you can move the conversation to a close and tell them you're here to help if they have further questions.

Mollick, Ethan R. and Mollick, Lilach, Assigning AI: Seven Approaches for Students, with Prompts (June 12, 2023). Available at SSRN: https://ssrn.com/abstract=4475995

Thank you!

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Q&A

NIST Writing and Resources on AI

- *Artificial Intelligence Risk Management Framework (AI RMF 1.0)* (Jan. 2023)
  https://www.nist.gov/itl/ai-risk-management-framework

  See also:

  - Trustworthy & Responsible AI Resource Center: https://airc.nist.gov/Home
  - Sep. 2023 *TIME* profile of Elham Tabassi, NIST Senior Research Scientist & Associate Director for Emerging Technologies: https://time.com/collection/time100-ai/6310638/elham-tabassi/

- *Towards a Standard for Identifying and Managing Bias in AI (NIST SP 1270)* (March 2022)
  https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1270.pdf

- *Four Principles of Explainable Artificial Intelligence (NIST IR 8312)* (Sep. 2021)
  https://nvlpubs.nist.gov/nistpubs/ir/2021/NIST.IR.8312.pdf

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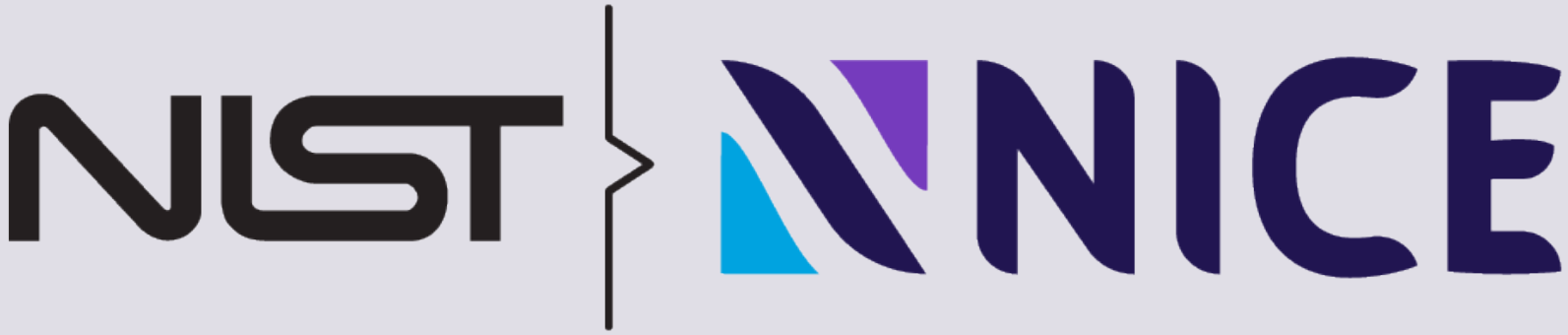
NICE Webinar Series & Special Events

International Tour of Cybersecurity Careers:
Stories Told by Current Practitioners
(October 17, 2023, 4:00-4:45PM ET)

Cultivating Cybersecurity Leaders:
The New Cybersecurity Career Ambassador Program
(October 18, 2023, 2:00-3:00PM ET)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