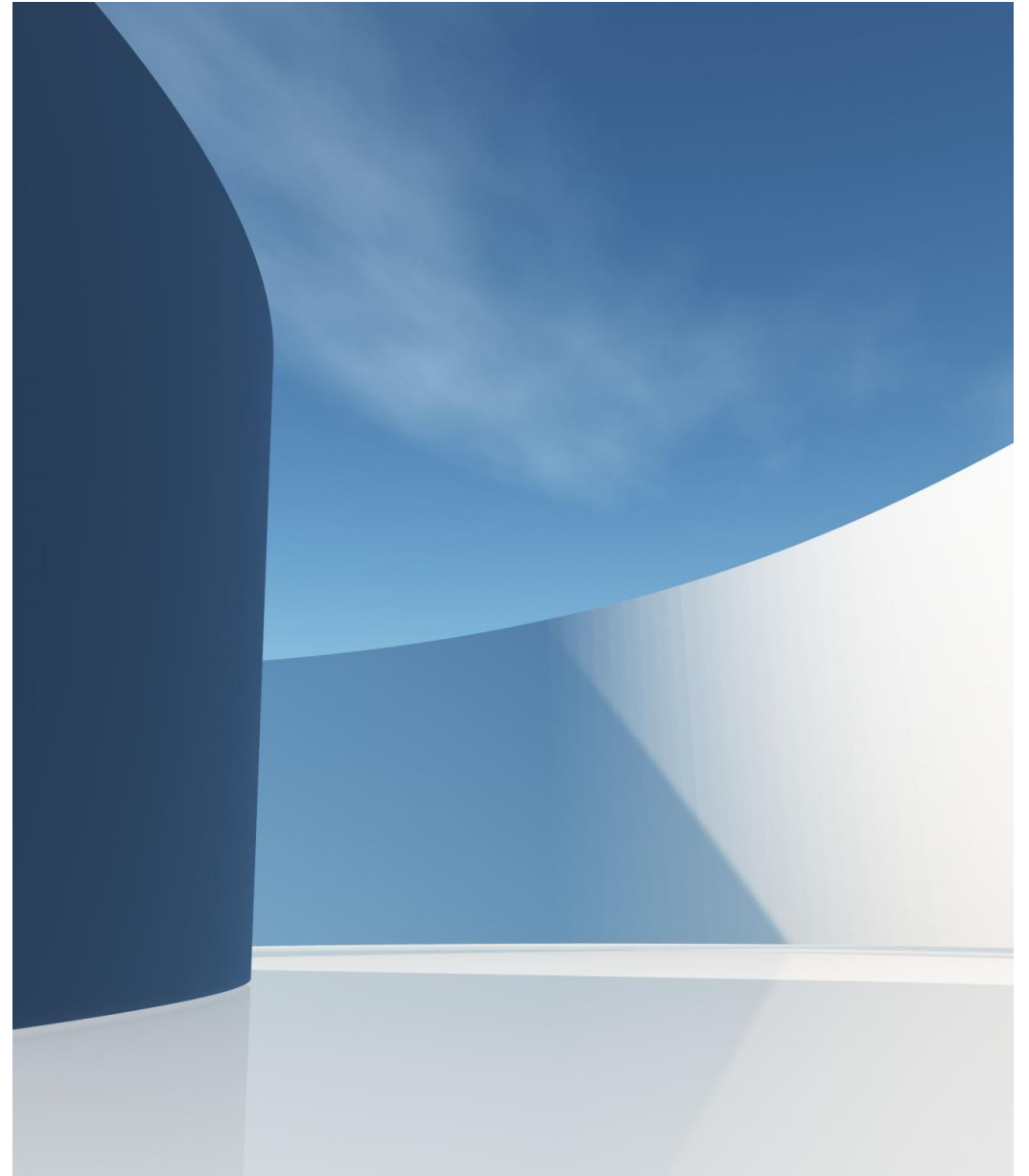

Teaching with **TEACHABLE:** Transforming Case Based Learning with Gen-AI

Geisel Academy of Educators
and Scholars AI Series

Galina Gheihman, MD

Assistant Professor of Neurology, Harvard
Medical School & Mass General Brigham

May 15, 2026



Disclosures

- No financial or other disclosures to report.

Objectives

Review

Review principles for designing and evaluating effective medical education innovations, including interventions

Analyze

Analyze how gen AI can be applied to instructional design through a case study: Teaching with TEACHABLE

Discuss

Discuss opportunities and challenges of teaching and learning with gen AI

Objectives

Review	Review principles for designing and evaluating effective medical education innovations, including interventions
Analyze	Analyze how gen AI can be applied to instructional design through a case study: Teaching with TEACHABLE
Discuss	Discuss opportunities and challenges of teaching and learning with gen AI

**How do we
learn best?**



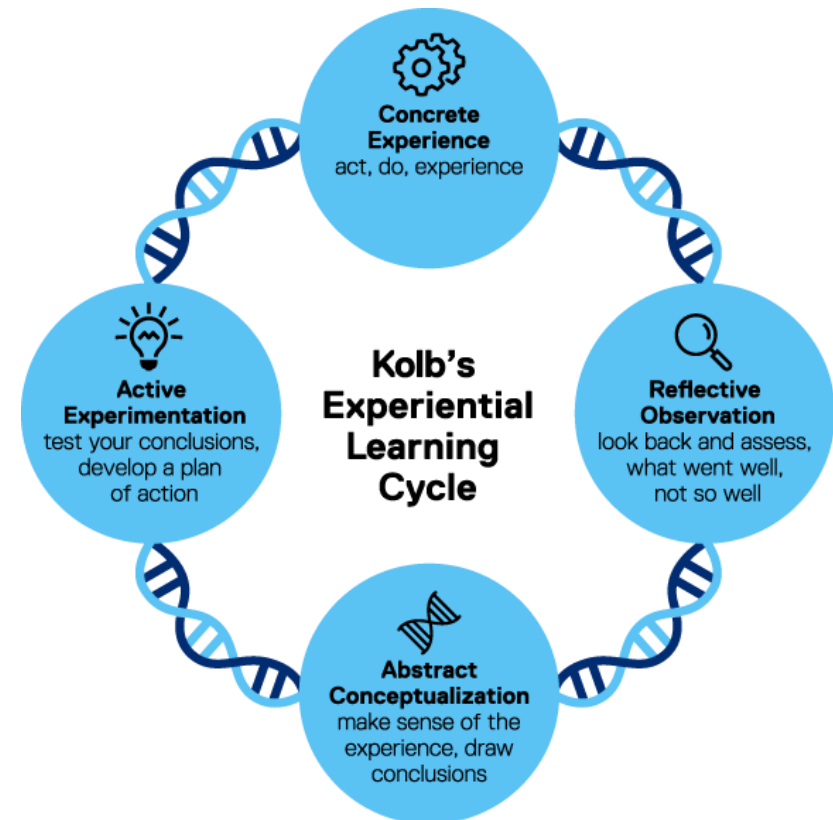
Two important medical education theories

Knowles' Adult Learning Theory

Adult learners:

- Prefer self-directed learning
- Want to focus on problems that are relevant and goal-oriented
- Have prior experiences to draw on
- Have strong intrinsic motivation
- Want to solve problems actively, and in collaborative teams
- (Attend to psychological safety)

Kolb's Experiential Learning Cycle



Case-based learning

PBL, TBL,
CBCL

Simulation

OSCEs



Case-based learning in medical education

Advantages

Self-directed

Task oriented, relevant, applied

Offers “real problems” to solve

Leverages past experiences

Collaboration and team-building

Direct observation & feedback

Authenticity of assessment

Challenges

Instructor time, preparation, training

Institutional resources

Variable learning experiences

Research/evaluation can be challenging

The promise of generative AI

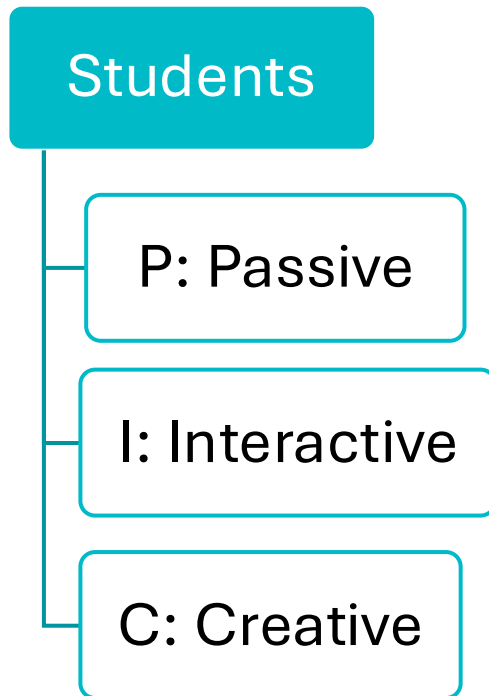
- Unprecedented content creation
 - Active learning – show, do
 - Automated feedback (formative)
 - Accessible, individualized
 - Personalized learning
 - Available at scale
- Addressing barriers
 - Faculty time
 - Faculty expertise/training
 - Digital expertise
 - Funding/resources

Personalization
Timeliness
Scalability

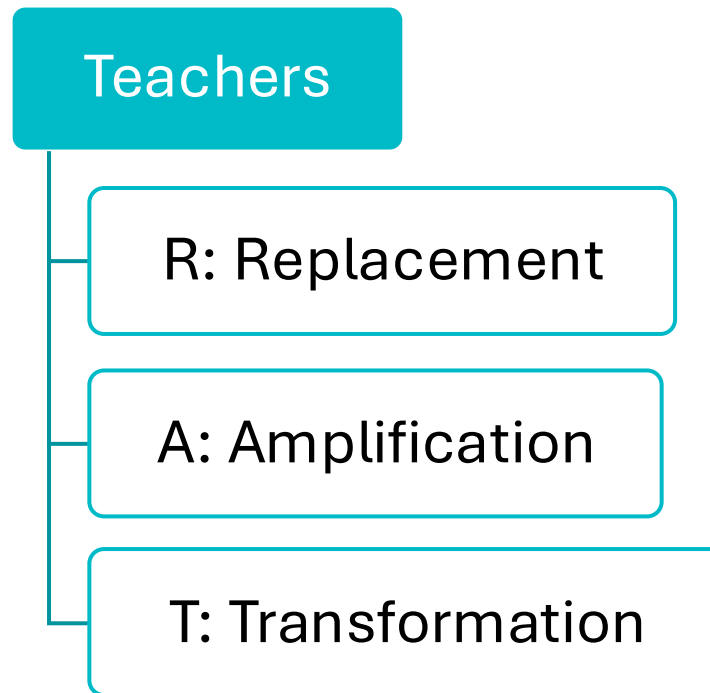
As educators, thinking differently about technology

PICRAT: A framework for technology use in education

What is the student's relationship to the technology?



How is the technology use influencing the teacher's pedagogy?



STUDENT

What is the student's relationship to the technology?

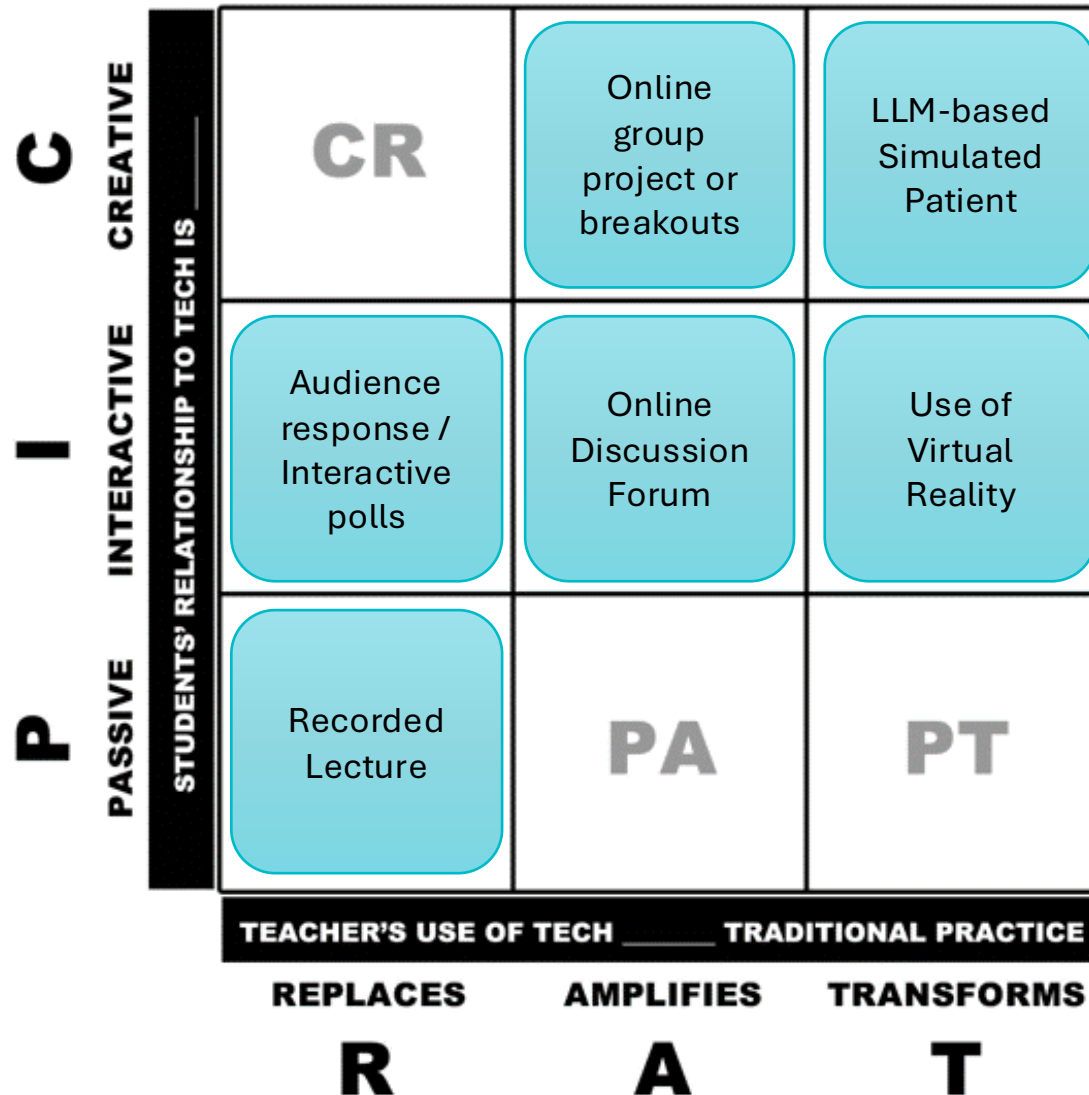
C CREATIVE	I INTERACTIVE	P PASSIVE	STUDENTS' RELATIONSHIP TO TECH IS _____	CR	CA	CT
				IR	IA	IT
				PR	PA	PT
				TEACHER'S USE OF TECH _____ TRADITIONAL PRACTICE		
				REPLACES	AMPLIFIES	TRANSFORMS
				R	A	T

TEACHER

How is the technology use influencing the teacher's pedagogy?

STUDENT

What is the student's relationship to the technology?



TEACHER

How is the technology use influencing the teacher's pedagogy?

As an educator, ask ...

- Does this technology replace, or does it **amplify and transform** my pedagogy?
- Is there an **evidence-base** for the technology or the principles behind its design?
- What caveats, concerns, and challenges can I **anticipate and mitigate**?

**Use best practices in learning sciences
and instructional design**


As an educator, ask ...

- Does the *Generative AI* technology replace, or does it **amplify and transform** my pedagogy?
- Is there an **evidence-base** for the *Generative AI*, or the principles behind its design?
- What caveats, concerns, and challenges can I **anticipate and mitigate**?

Use best practices in learning sciences and instructional design

VIEWPOINT ARTICLE

The Educator-in-the-Loop: Intentional Integration of Generative Artificial Intelligence in Health Professions Education

Galina Gheihman¹  | Hange Li² | Gergely Csaba³ | Stephen Bacchi⁴  | Kathleen Huth⁵ | Traci A. Wolbrink⁶

Objectives

Review	Review principles for designing and evaluating effective medical education innovations, including interventions
Analyze	Analyze how gen AI can be applied to instructional design through a case study: Teaching with TEACHABLE
Discuss	Discuss opportunities and challenges of teaching and learning with gen AI

What if?

We had a flexible, case-based, student-centered learning platform designed for real-world teaching?

- Required no preparation
- Worked for individuals or groups
- Could be facilitated or self-guided
- Adapted to each learner's level
- Delivered real-time feedback
- Supported skill development

Think *curation*, rather than *creation*





TEACHABLE

[All Cases](#)[Cases By Specialty](#)[Self-Assessment MCQs](#)[Previously Completed MCQs](#)[About](#)[Sign up](#)[Login](#)

Transforming Education And Clinical Healthcare through Agent-Based Learning and Evaluation

TEACHABLE

Transforming Education And Clinical Healthcare through Agent-Based Learning and Evaluation

Case-based review where you perform the history/exam/tests!

Please [sign up](#) or [login](#)

Cases for Specialty: Neurology

[Back To Specialty Selection](#)

Case 001 – Headache

Mr John Jackson is a 23-year-old male who has presented to the emergency department with a headache...

Challenge level: Easy

Best score: **85.7%**

Case 002 – Upper Limb Weakness

Mrs Elizabeth Jones is a 30-year-old female who has presented to a rural emergency department in a ...

Challenge level: Easy

Best score: **80.0%**

Case 003 – Dizziness

A 41-year-old female has presented to the emergency department with sudden onset of dizziness.

Challenge level: Easy

Best score: **60.0%**

Case 004 – Vision Loss

Mr Graham Potter is a 68-year-old male who has developed vision loss in his right eye, and has pres...

Challenge level: Intermediate

Best score: **75.0%**

Case 005 – Diplopia

A 60-year-old male has diplopia and presents to the emergency department.

Challenge level: Intermediate

Case 006 – Lower Limb Weakness

Mrs Joan Baker, a 73-year-old female, has presented to the emergency department with lower limb wea...

Challenge level: Easy

Case 007 – Abnormal Gait

A 71-year-old female presents with an abnormal gait to her general practitioner.

LIVE DEMO: TEACHABLE



All Cases

Cases By Specialty

Self-Assessment MCQs

Previously Completed MCQs

About

 Sign up

 Login

TEACHABLE

Transforming Education And Clinical Healthcare through Agent-Based Learning and Evaluation

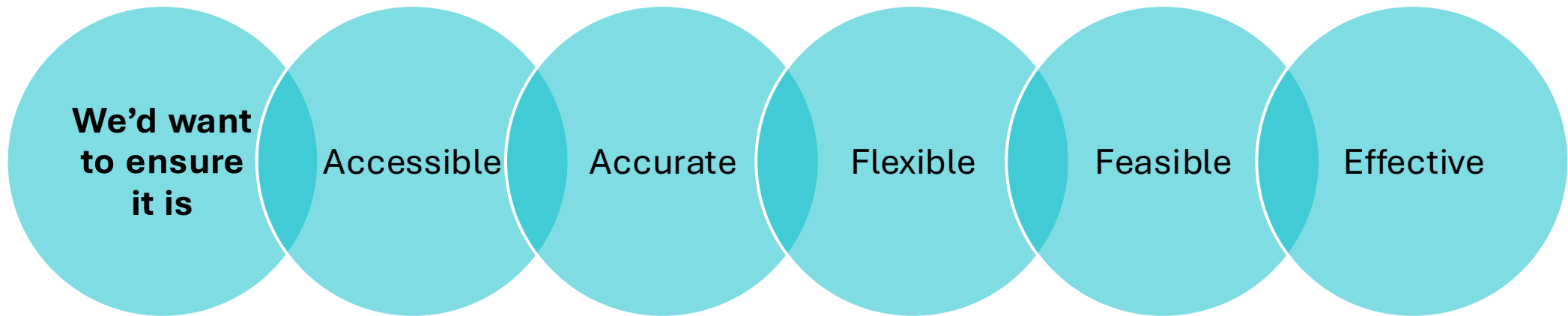
Case-based review where you perform the history/exam/tests!

Please [sign up](#) or [login](#)

CHOOSE YOUR OWN ADVENTURE



If we had a flexible, case-based, student-centered learning platform designed for real-world teaching...



Accessible

Sign up and HAVE A PLAY!

1. Log onto www.researchteaching.com or use the QR Code
2. Sign Up:
 - a. Click Sign Up
 - b. Create a username and password
 - c. Enter Sign-Up Code: **learningrocks**
3. Your Task:
 - a. Try out a case or two
 - b. Consider, how might you use this tool?



Accurate

- Among 5 neurology cases, **856/857 (99.9%) answers** were appropriate, with a <0.1% hallucination rate
- Generalizes to other subspecialty domains, in 5 perioperative cases; **543/547 (99.3%)** of LLM responses were medically appropriate with zero problematic hallucinations observed
- In converting cases from the literature, overall proportion of appropriate responses was **206/210 (98.1%)**





Flexible

Current content

- **>100 cases**, peer-reviewed by faculty
- **30** specialties represented
- Multi-step cases, international settings, variable difficulty options
- Different learning objectives: clinical reasoning, triage, communication
- Offers immediate feedback, supporting deliberate practice

In development: examiner AI, interprofessional cases, non-English cases

For the educator: no technical background required to add cases, admin access to adapt cases to local needs, view student interactions

What about feedback?

- 5 cases undertaken by 4 students
- Experts and LLM provided numerical scores based on a rubric with key points
 - High correlation among scores, responds to calibration
- Experts and LLM provided narrative feedback based on a rubric with key points
 - Blinded raters assigned scores using QuAL, EFeCT
 - LLM feedback was more consistent, comprehensive
 - LLM feedback of higher quality vs. experts for H&P
 - No significant differences in feedback for A&P
 - No inaccuracies



Qian C et al, Medical Science Educator, 2025
Fruitman et al, Neurology: Education (Accepted), 2026

Feasible

Feasibility prospective studies

A. Neurology clerkship

B. Neurology preclinical course



HARVARD
MEDICAL SCHOOL

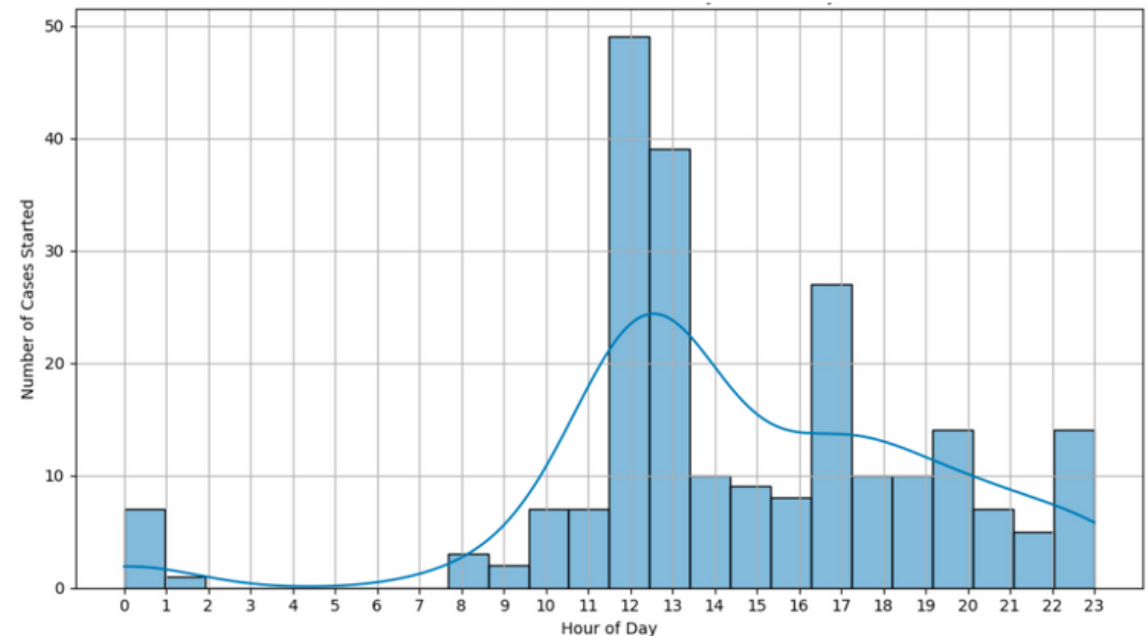


Mass General Brigham

With thanks to Tamara Kaplan, MD & Stephen Bacchi, MBBS, PhD

A. HMS Neurology Clerkship

- Feasibility in real-world clerkship setting: **35/38 (92.1%)** completed at least one case
- **Two-thirds** agreed the cases enhanced their understanding and engagement compared to traditional teaching methods.
- Students appreciated
 - Support for history-taking skills
 - Support for generating differential
 - Authentic experiences
 - Real-time feedback
 - Flexibility to engage at their own pace



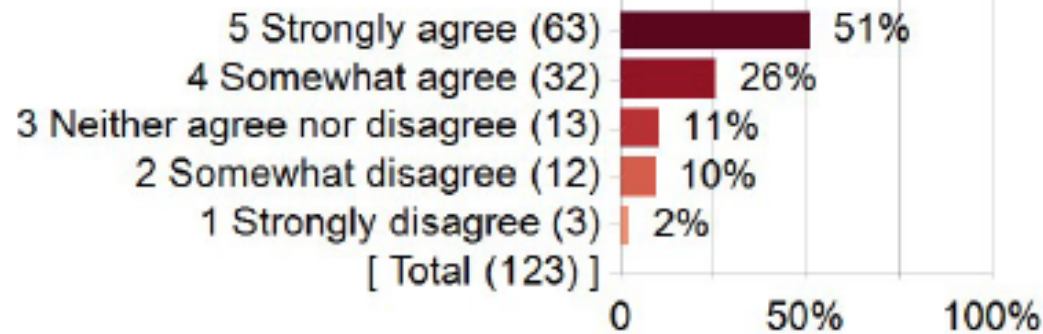
B. HMS Preclinical Neurology Course

- We adapted clinical cases **to fit the needs of preclinical students**
 - Instead of generating an A&P, students answered knowledge based, basic science multiple choice questions aligned with course objectives
- Designed to model **interactive, simulated patient encounters** while reinforcing weekly concepts from the course

Preliminary Results

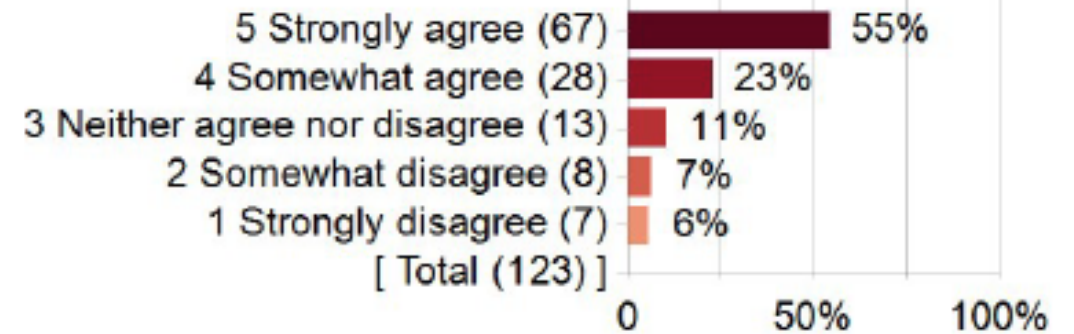
- 172 students accessed the cases over 8 weeks
 - Students completed **1,236 cases** (~7.2 cases/student)
 - **23,310** questions asked (~19 questions/student/case)
- 123/172 students (71.5%) completed post course survey

1. The online AI cases helped me consolidate my knowledge about /my understanding of neurological conditions.



Statistics	Value
Response Count	123
Mean	4.1
Standard Deviation	1.1

2. I would like equivalent online AI cases to help consolidate knowledge in other classes.



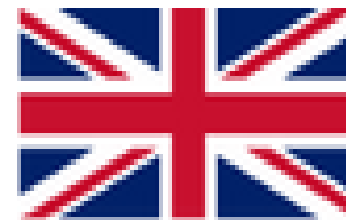
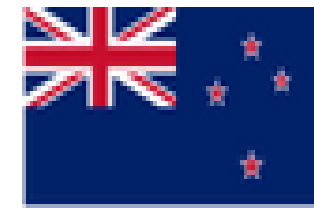
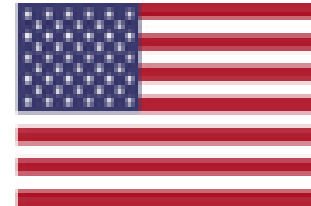
Statistics	Value
Response Count	123
Mean	4.1
Standard Deviation	1.2

Coming soon to medical schools beyond HMS

- Demonstrating generalizability and local adaptability

- **With thanks to our collaborators**

- New York Medical College
- Yale School of Medicine
- University of Missouri Health
- Henry Ford Health System
- Johns Hopkins University
- Emory University
- McGill University (Canada)
- Otago University (New Zealand)
- University of South Adelaide (Australia)
- University of Cambridge (UK)
- Jefferson University



Upcoming collaborations

- **NYMC preclinical neurology course**
 - Replication study
- **Otago implementation**
 - Non-randomized controlled trial examining medical rotation performance
 - Also tested perceived usability & conducted a focus group
- **JHU multi-specialty implementation**
 - Leveraging TEACHABLE for deliberate practice n clerkships in multiple disciplines
- **PresentIQ**
 - TEACHABLE cases paired with an AI-powered system that provides specialty-specific, structured feedback for student oral presentations
 - Cases feel authentic, true-to-life, based on published cases; no HIPAA concerns





Effective

Future opportunities

- **Impact on learning (short- and long-term outcomes)**
 - Performance in preclinical course
 - Performance on clerkships
 - Performance on OSCEs
 - **Transcript analysis**
 - Clinical reasoning markers
 - **Student and faculty experiences and perspectives**
 - Open-ended responses
 - Semi-structured interviews
-

Lessons Learned

- Large, interdisciplinary, collaborative team with different skillsets
 - Monthly touchpoint
 - Priority setting for rotating projects
- Partnership with learners
 - Codesign, research, mentorship opportunities
- Humility
 - Caution, curiosity, evidence

Thanks to the growing team

USA

- Tamara Kaplan (HMS)
- Haatem Reda (HMS)
- W. Taylor Kimberly (HMS)
- Haelynn Gim (HMS)
- Carolyn Qian (HMS)
- Ashley Paul (JHU)
- Jules Jung (JHU)
- Keenan Davis (Emory)
- Josephine Buclez (Emory)
- Douglas Falls (Emory)
- Christopher Moran (MGH)
- Adam Rodman (BIDMC)
- Harry Sutherland (Yale)
- Laura Stein (NYC)
- Adam Karp (NYMC)
- Tracey Milligan (NYMC)
- Grace Kimbaris (Penn)
- Mahdi Fadel (HFH)
- Rani Vasireddy (UT)

Australia

- **Stephen Bacchi (Adelaide)**
- Christina Gao (Adelaide)
- Benjamin Cook (Adelaide)
- Timothy Trewren (Adelaide)
- Aashray Gupta (Sydney)
- Joshua Kovoor (Brisbane)
- Jamie Bellinge (Perth)
- Brandon Stretton (Adelaide)
- Josephine Thomas (Adelaide, Dean)
- Matthew Arnold (Adelaide, Y1 Course)
- Thomson Delloso (Adelaide, Nursing)
- Emily Eglitis (Adelaide, Physiotherapy)
- Jacinta Johnson (Adelaide, Pharmacy)

New Zealand

- Tony Zhang (Auckland), Steve Gallagher (Otago)

Canada

- Stuart Lubarksy (McGill), Liam McCoy (Alberta / MIT)

UK

- Sybil Stacpoole (Cambridge University)



**+ Everyone who is
interested in joining us!**



Sign Up Code:
learningrocks

Where you fit in: Potential areas for collaboration



Develop novel cases and learning strategies

Develop cases for a variety of learners, specialties, and competencies



Implement across institutions & learners

Help scale this resource to make it available to more learners around the world



Contribute to the science of learning

Help us study student and educator experiences and impact on learning

Help us make TEACHABLE a freely available, scalable resource that supplements existing curricula to provide asynchronous, AI-powered, personalized, clinical learning and feedback through case simulation.

Objectives

Review

Review principles for designing and evaluating effective medical education innovations, including interventions

Analyze

Analyze how gen AI can be applied to instructional design through a case study: Teaching with TEACHABLE

Discuss

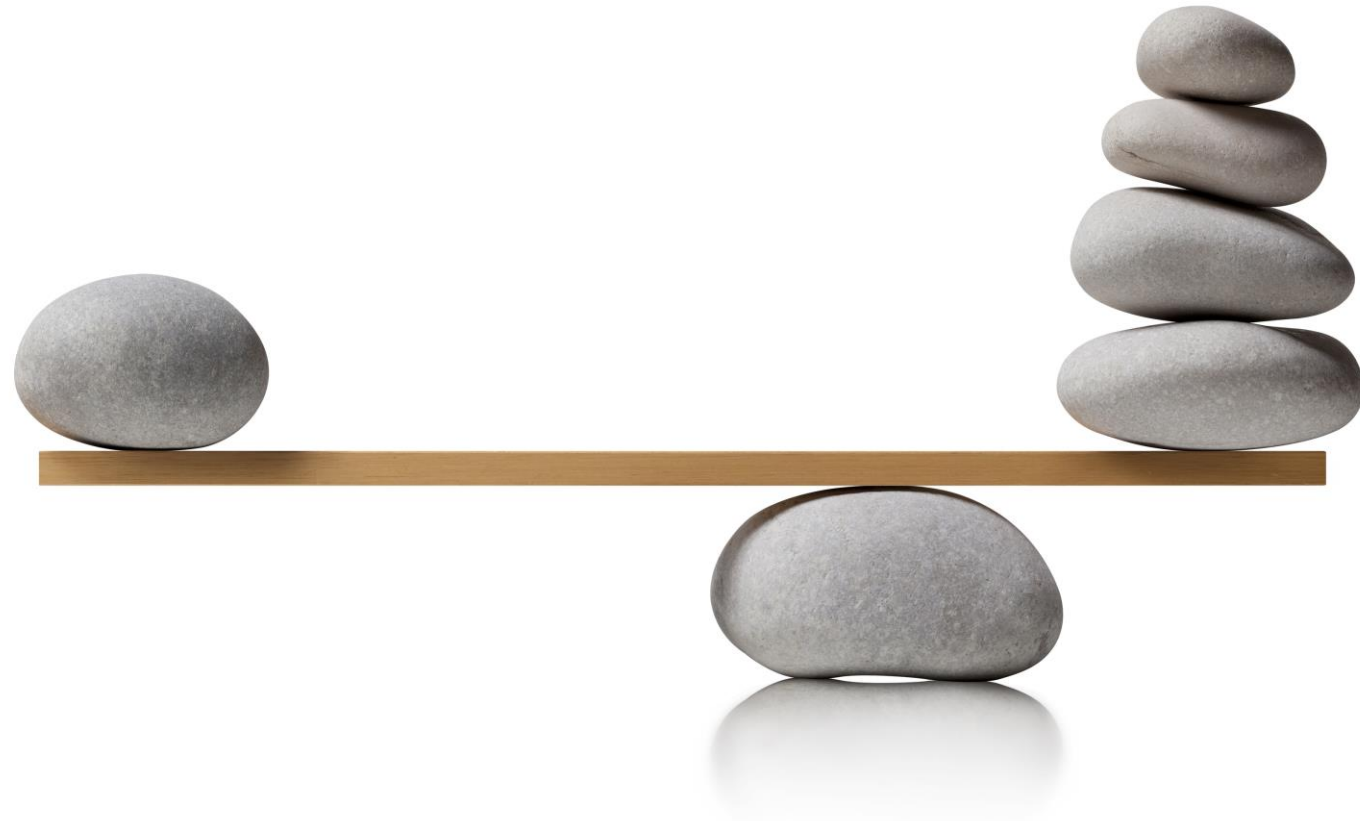
Discuss opportunities and challenges of teaching and learning with gen AI

Thinking critically about TEACHABLE

Benefits?

Cautions?

Your ideas?



Cautions

Bias

Inaccuracy

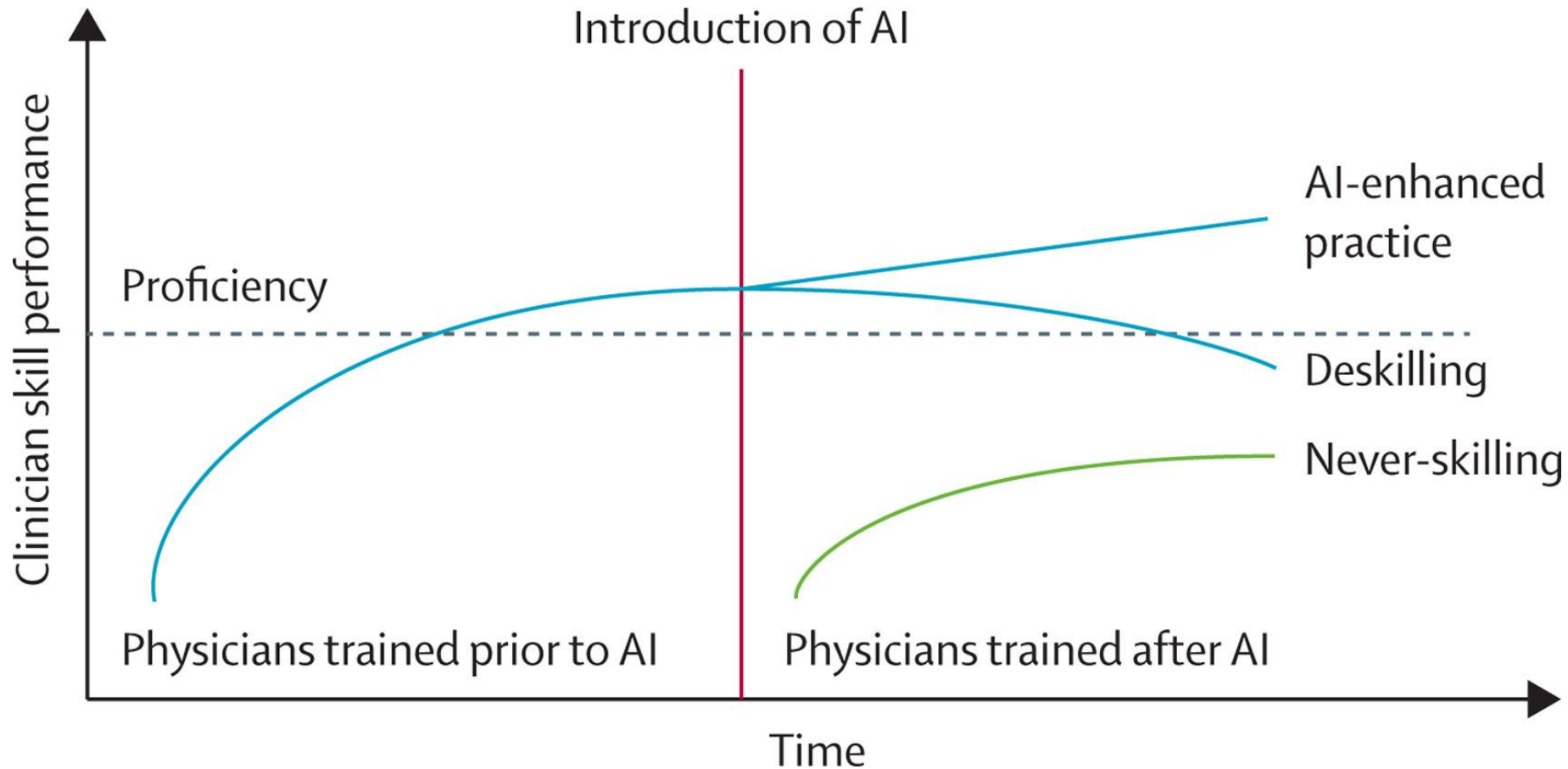
Privacy

Over-
reliance

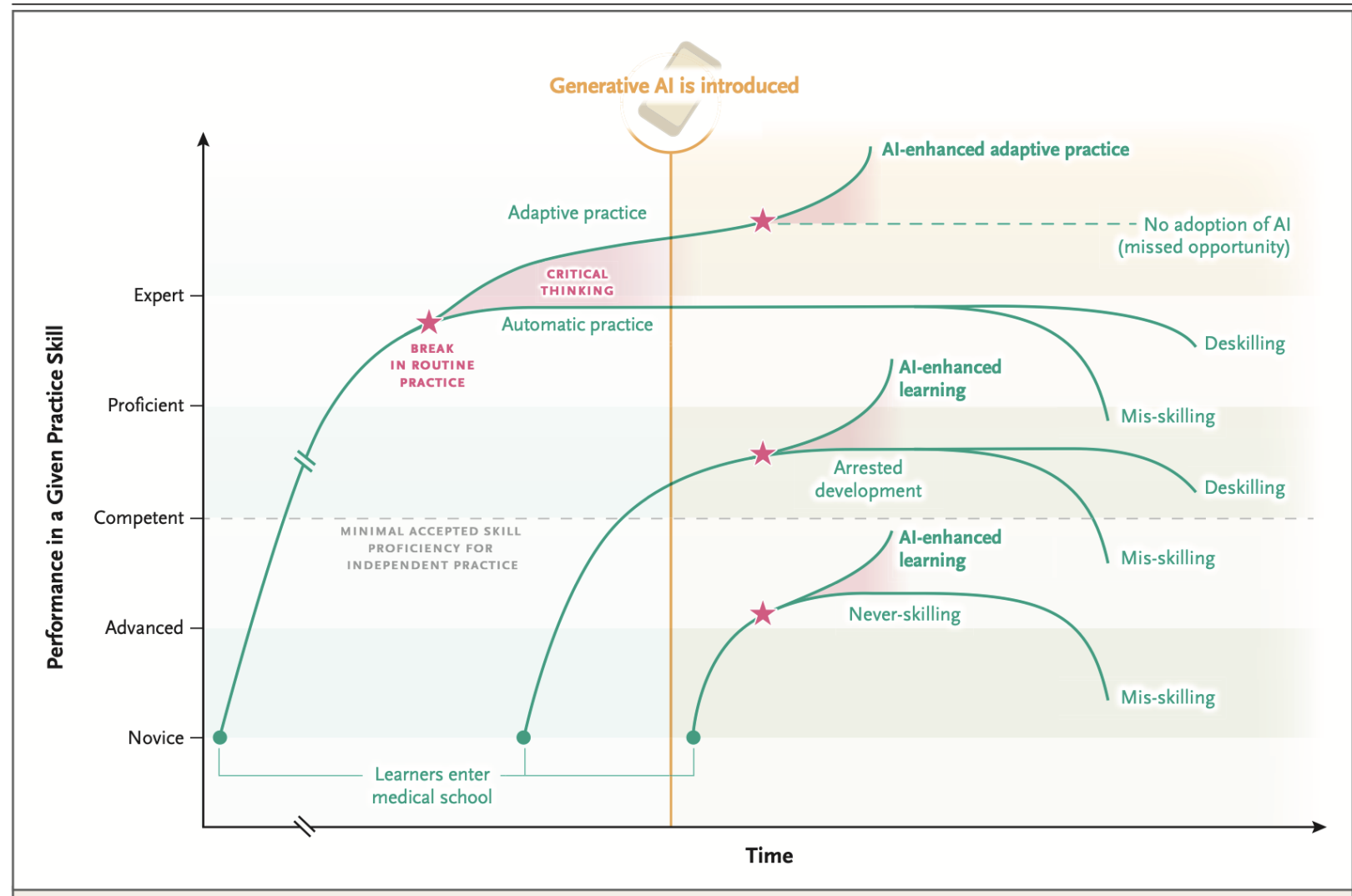
Preserving clinical skills in the age of AI assistance

[Tyler M Berzin](#)^a [✉](#) · [Eric J Topol](#)^b

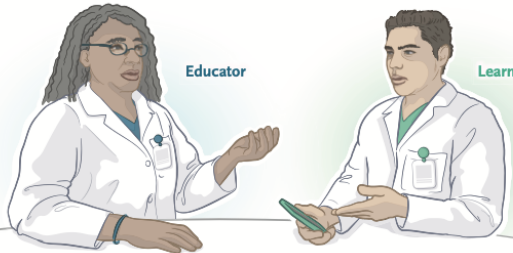
- Mis-skilling
- De-skilling
- Never skilling



AI introduces unprecedented potential but also risks



DEFT-AI
to promote critical thinking during AI use



Diagnosis, Discussion, and Discourse	The educator asks for a description of the learner's specific use of AI.
What specific AI did you use?	I used the free version of ChatGPT on my phone.
How did you use AI in this process?	I just typed in, "What is the differential diagnosis for wheezing?"
What prompts did you enter in the app?	I asked it for the best diagnostic test and treatment strategy.
Evidence	The educator asks for an evaluation of the learner's evidence-based use of AI
How did you verify the AI-generated outputs?	Hmm. I didn't. The answers seemed reasonable to me.
Is the AI that you used shown to be accurate and safe?	Yes. I keep seeing social media posts about how great it is at making diagnoses.
Feedback	The educator asks the learner to reflect on growth opportunities in the use of AI.
How do you evaluate your own use of AI in this case?	I think I've become quite familiar at using ChatGPT. I use it all the time now.
How can you improve your use of AI?	I can't wait for an AI that can interpret ECGs and chest radiographs. I should verify the AI outputs next time.
Teaching	The educator provides focused teaching points based on findings from the conversation and recommends whether, when, and how to use AI safely moving forward.
<p>Use AI tools that are known to be effective. Look for peer-reviewed evidence of their accuracy and safety. Our institution may have adapted and validated a similar model on the basis of high-quality data.</p> <p>Prompting a chatbot is critical to generate valuable and accurate outputs. Think of it as talking with a consultant: provide enough specific information about the Who (the intended role of the AI and your role), the Where (description of the context), and the What (your goal and specific task or question). Always ask the AI to explain its reasoning, which improves its answers and lets you assess how it is thinking and how much to trust it. One prompt is not enough: have a conversation and give it feedback. Just like I did with you, you can also ask it to engage in self-reflection and look for errors.</p> <p>AI is always prone to error and bias: always verify and trust. Make sure to check its answers against your knowledge, trusted sources of medical information, like publications from the NEJM Group, and your trusted peers, like me.</p>	
Recommendation for AI engagement	The educator provides learner-specific recommendations for the safe use of AI.
<p>Keep practicing using AI to inform your reasoning rather than replace it. AI outputs are your preliminary inputs, just like a preliminary radiology report or automated ECG interpretation: verify, then trust. Know when you can rely on it (cyborg) and when you need to confirm the outputs (centaur).</p>	

DEFT-AI Framework

Discussion

Evidence

Feedback

Teaching

Recommendation for **AI**
engagement

Particular risks in education



1. Limited evidence for efficacy

- Impact on clinical and education outcomes is limited
- Content generated may be of lower quality

2. Risk of deskilling

- Long term consequences of overreliance
- Inability to evaluate accuracy

3. Unintended harm to students

- Misuse among students (plagiarism, over-reliance)
- Misuse among educators (inappropriately deployed, AI may reduce learner efficiency, limit collaboration, impede communication with faculty, etc)

**Gen AI is
here to stay
– how do we
use it best?**



3/s for intelligent next-gen medical education



- **Be intentional**
 - Support active, self-directed learning with feedback
 - Apply ethical principles
- **Be informed**
 - Collaborate across disciplines
 - Keep learning to train yourself
- **Be inspired**
 - Think creatively
 - Partner with students
 - Don't be afraid to give it a try!

Objectives

Review

Review principles for designing and evaluating effective medical education innovations and interventions

Illustrate

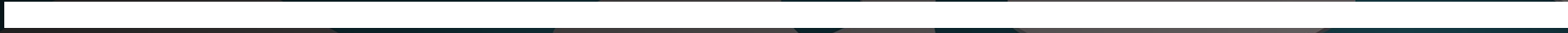
Illustrate intentional use of AI for instructional design through a case study: Teaching with TEACHABLE

Discuss

Discuss opportunities and challenges of teaching and learning with generative AI

A new mindset for using gen AI in education

- Gen AI is a **design partner** that amplifies creativity and transforms pedagogy
 - Integrate learning theory, use educational best practices, and consider equity and inclusion
- Cultivate a **growth mindset** regarding use of technology to enhance education
- Support **open dialogue** about gen AI and role model disclosure
- Encourage **iterative design** cycles, pauses for critical thinking, and interdisciplinary collaboration
 - Draft, verify, reflect, revise; you are ultimately accountable
- **Teach with and about gen AI**; support students to grapple with ethical issues



Q&A





Thank You!

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LinkedIn: Galina Gheihman, MD



HARVARD
MEDICAL SCHOOL



Mass General Brigham

neuro



PRAXIS

**Neuropraxis: The Neurology
Educator's Podcast:**

<https://neuropraxis.buzzsprout.com/>

Sign up and HAVE A PLAY!

1. Visit www.researchteaching.com or use QR Code
2. Sign Up:
 - a. Click Sign Up, create username/password
 - b. Enter sign-up code: **learningrocks**
 - c. Try out a case or two
3. Consider
 - a. How might you use this tool?
 - b. How would you adapt it for your learners?
 - c. How might you evaluate it?

