



# AI in Medical Education: Frameworks & Futuring

Sara Keeth, PhD, PMP

Director of Learning and Institutional Success

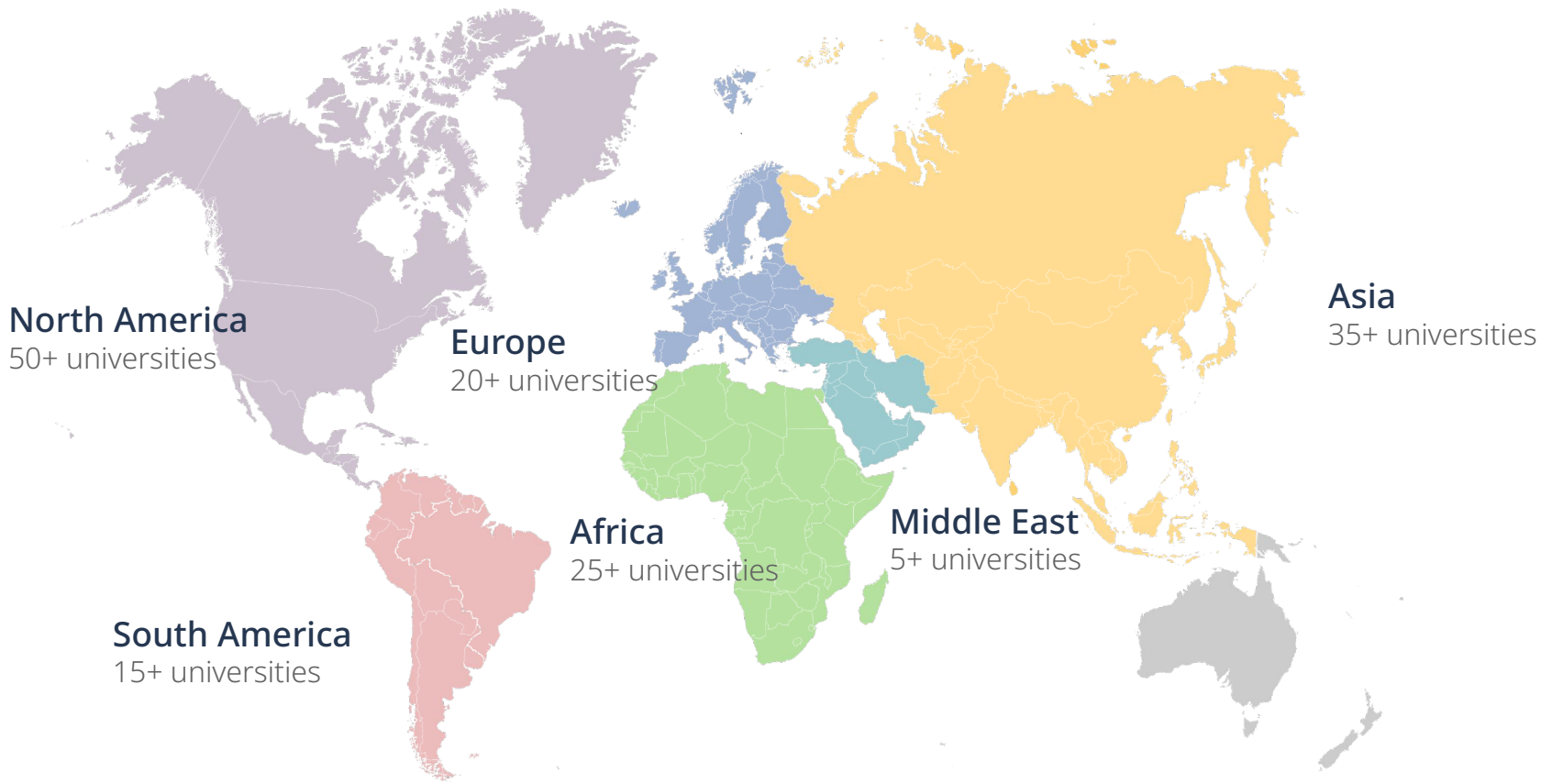


# Today's Speaker



## **Sara Keeth, PhD, PMP**

Director of Learning and Institutional Success  
at Lecturio



**North America**  
50+ universities

**Europe**  
20+ universities

**Asia**  
35+ universities

**South America**  
15+ universities

**Africa**  
25+ universities

**Middle East**  
5+ universities



# Today's Agenda

1

Overview, terms and definitions,

2

The current state of AI, prompting, and apps

3

Current challenges of AI in medical education

4

A 1:1 learner-centered framework

5

The user-centered future: predictions & application



# What Is Generative AI?

Generative AI refers to deep-learning models that can generate high-quality text, images, and other content based on the data they were trained on.

How have you used AI so far?

- a. I haven't tried any LLMs (such as ChatGPT)
- b. I have tried ChatGPT or another LLM
- c. I am a power user!

**Poll 1**



# Large Language Model (LLM)

A large language model (LLM) is a type of **artificial intelligence (AI) algorithm** that uses **deep learning** techniques and massively large data sets to understand, summarize, generate and predict new content.

The term **generative AI** also is closely connected with LLMs, which are, in fact, a type of generative AI that has been specifically architected to help generate text-based content. Examples: ChatGPT, Bard, and Claude.



## Terms & Definitions

Artificial Intelligence (AI) refers to the **simulation of human intelligence in machines** that are programmed to think and learn like humans.

It involves the development of **algorithms** and **computer programs** that can **perform tasks** that typically **require human intelligence**, such as visual perception, speech recognition, decision-making, and language translation.



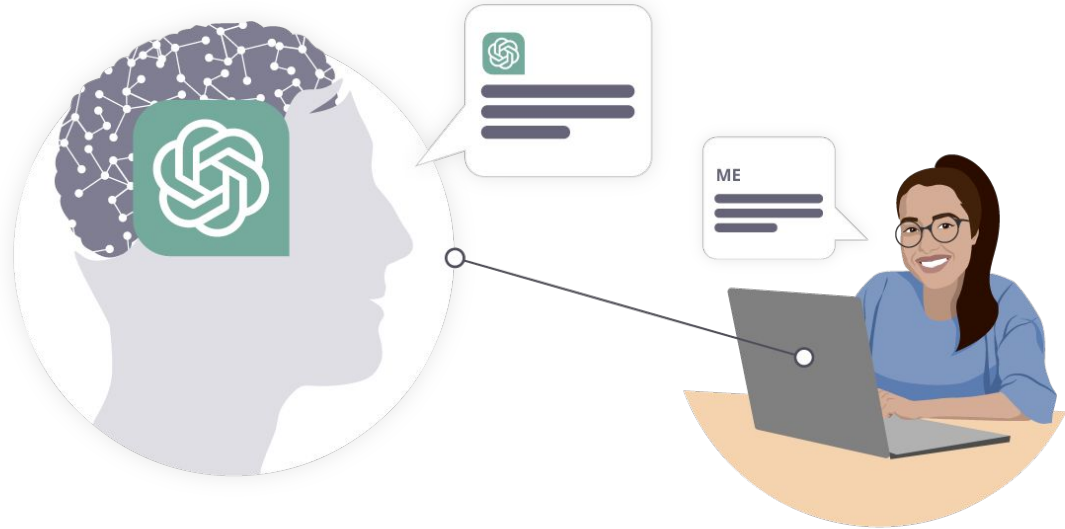
How do you feel about the future of AI in medical education?

- a. I am optimistic
- b. I am neutral
- c. I am concerned
- d. It's complicated

**Poll 2**



# AI: Where Are We Today?



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LETTERS TO THE EDITOR

Large Language Models and Their Implications on Medical Education

Bair, Henry<sup>1</sup>; Norden, Justin MD, MBA, MPhil<sup>2</sup>

Author Information ⓘ

Academic Medicine 98(8):p 869-870, August 2023. | DOI: 10.1097/ACM

FREE

Research Letter

August 24, 2023

Use of Artificial Intelligence Chatbots for Cancer Treatment Information

Shan Chen, MS<sup>1</sup>; Benjamin H. Kann, MD<sup>1</sup>; Michael B. Foote, MD<sup>2</sup>; et al

» Author Affiliations | Article Information

JAMA Oncol. 2023;9(10):1459-1462. doi:10.1001/jamaoncol.2023.2954

ACADEMIC MEDICINE | AAMC  
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LETTERS TO THE EDITOR

Finding the Place of ChatGPT in Medical Education

van de Ridder, J.M. Monica PhD, MSc<sup>1</sup>; Shoja, Mohammadali M. MD<sup>2</sup>; Rajput, Vijay MD, MACP<sup>3</sup>

Author Information ⓘ

Academic Medicine 98(8):p 867, August 2023. | DOI: 10.1097/ACM.0000000000005254

FREE

Metrics

HOME > TECH

ChatGPT generates cancer treatment plans that are full of errors, study shows

Tom Carter Aug 25, 2023, 10:10 AM EDT

📄 📱 📧 🔄

# How Many of You Have Used or Tried ChatGPT (or Other LLMs)?

1

Got excited about AI and Chat GPT

2

Tried a few prompts in ChatGPT or similar models (LLM)

3

Didn't get what I thought I would. Adjusted prompts, got frustrated.

4

Bookmarking prompts; "I'll come back to that when I have time"

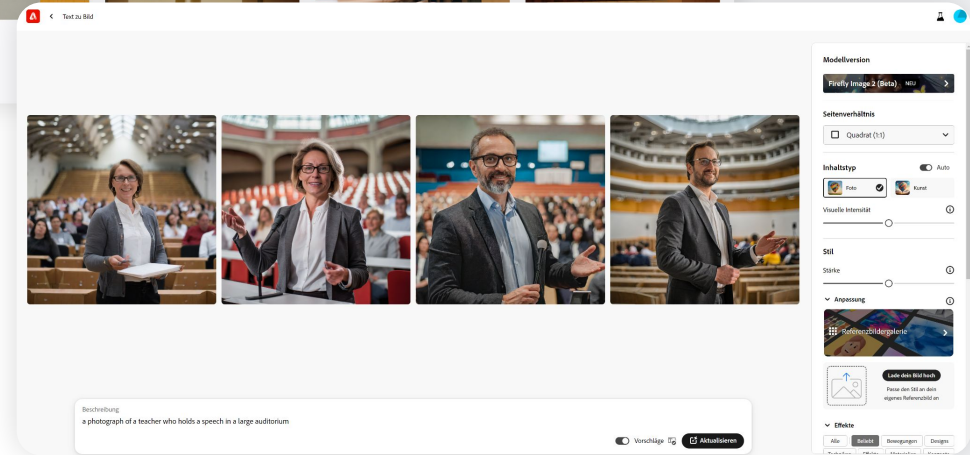
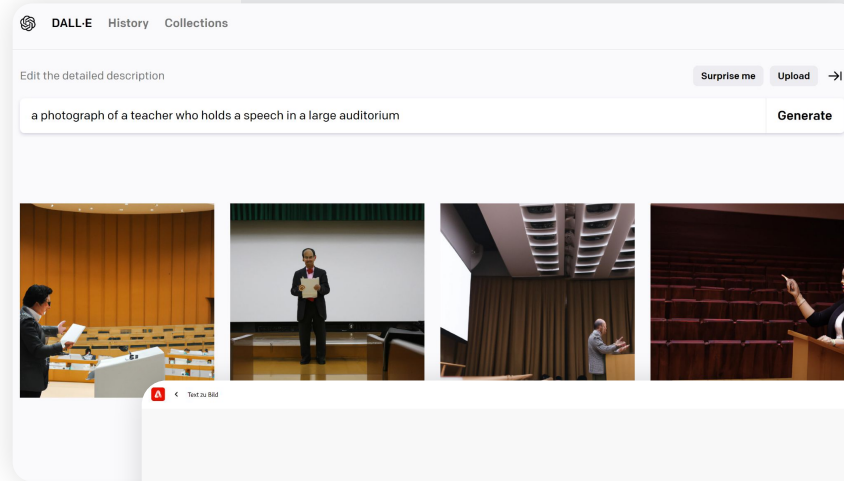


## Simple Prompt

“Generate a set of flashcards on (insert medical topic). Each card should include the disease’s definition, common symptoms, risk factors, diagnostic tests, and current treatment guidelines.”


# Text-to-Image Systems

- Dall-e
- MidJourney
- Adobe Firefly
- Stable Diffusion



# Adobe Firefly

Text zu Bild



Modellversion  
Firefly Image 2 (Beta) NEU

Seitenverhältnis  
 Quadrat (1:1)

Inhaltstyp  
 Foto  Kunst

Visuelle Intensität

Stil  
Stärke

Anpassung  
Referenzbildergalerie

Lade dein Bild hoch  
Passe den Stil an dein eigenes Referenzbild an

Effekte  
Alle **Beliebt** Bewegungen Designs  
Techniken Effekte Materialien Konzepte

Beschreibung  
a nurse is sitting on the counter of a hospital

Vorschläge Aktualisieren



# Stable Diffusion

- Open Source (Free to use)
- Can use it locally
- Big community
- Many extensions
- Many different models
- Flexible
- Very controllable
  
- **Not so user-friendly**
- **High system requirements**
  
- **“Easy to learn, hard to master”**





# GPTs

- Many power users maintain a list of carefully crafted prompts and instruction sets, manually copying them into ChatGPT.
- GPTs now do all of that for you.





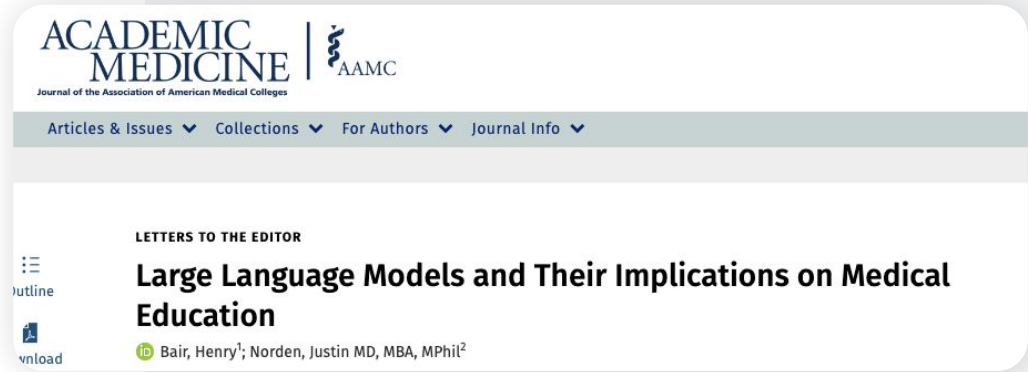
# AI in Med Ed: Current Challenges



“Today, **medical students are using these tools** to explain complicated medical concepts in simple terms, generate self-study questions, and produce preliminary differential diagnoses and treatment plans.

**Residents are using these tools** to summarize research papers and automate insurance, referral, and other correspondences.

**Patients are using these tools** for self-diagnosis.”



# Known Challenges

1

## Trust

Not sure if I can trust the sources or the output

2

## Privacy

Data Privacy concerns (student data, patient data)

3

## Integrity

Plagiarism and Academic Integrity

4

## Decision Making

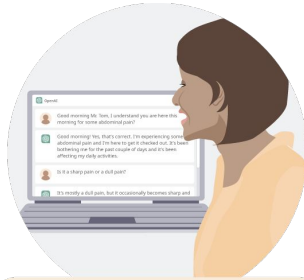
How are algorithms making decisions?  
“Black box” problem



# What Are the Problems That AI Can Help Us Solve Today?



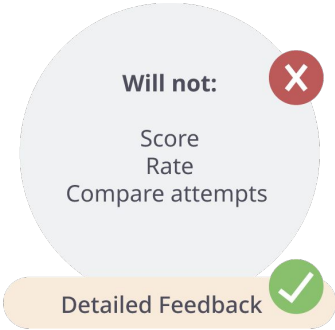
# AI in Med Ed: A Learner- Centered Framework



Discussion Practice



Prompt with Framework

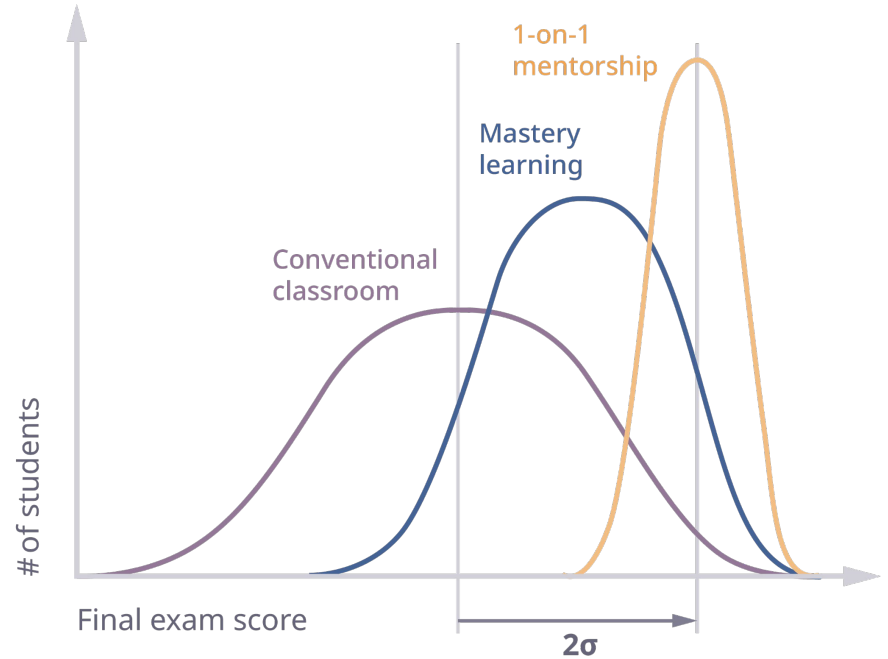


Detailed Feedback



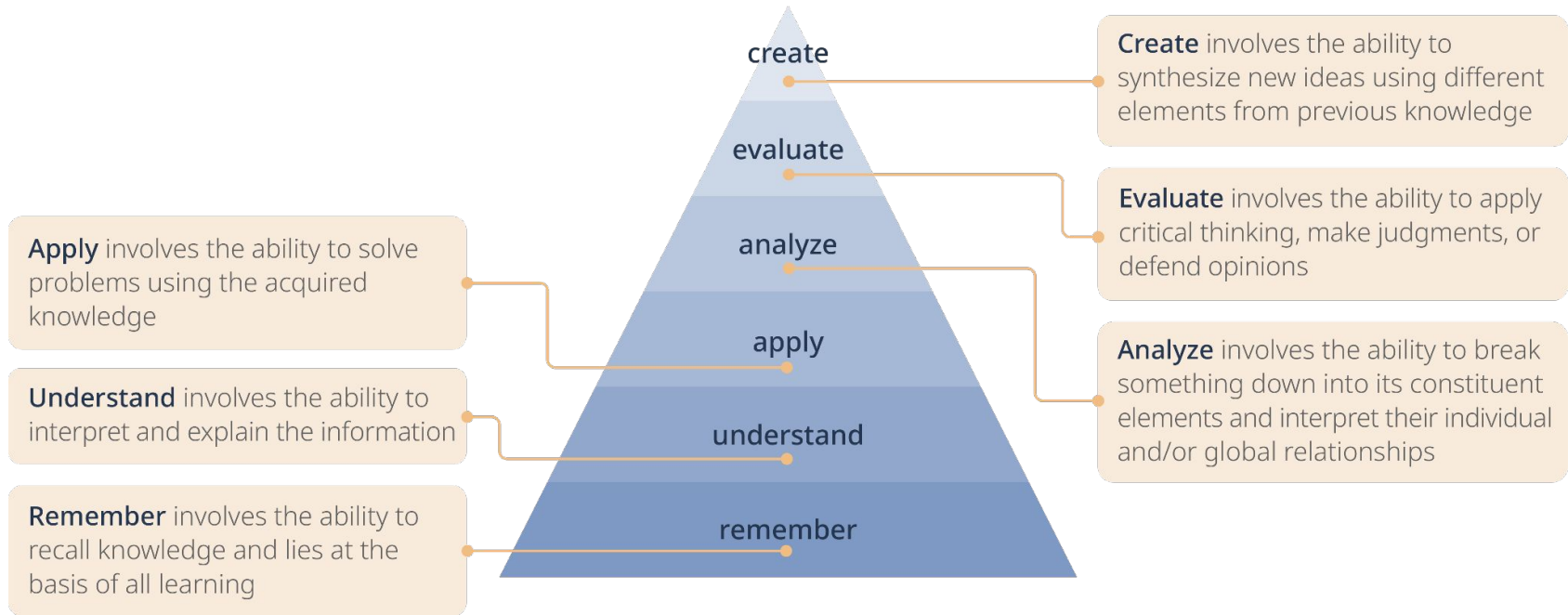
# Bloom's 2 Sigma Problem

One framework for using AI in medical education





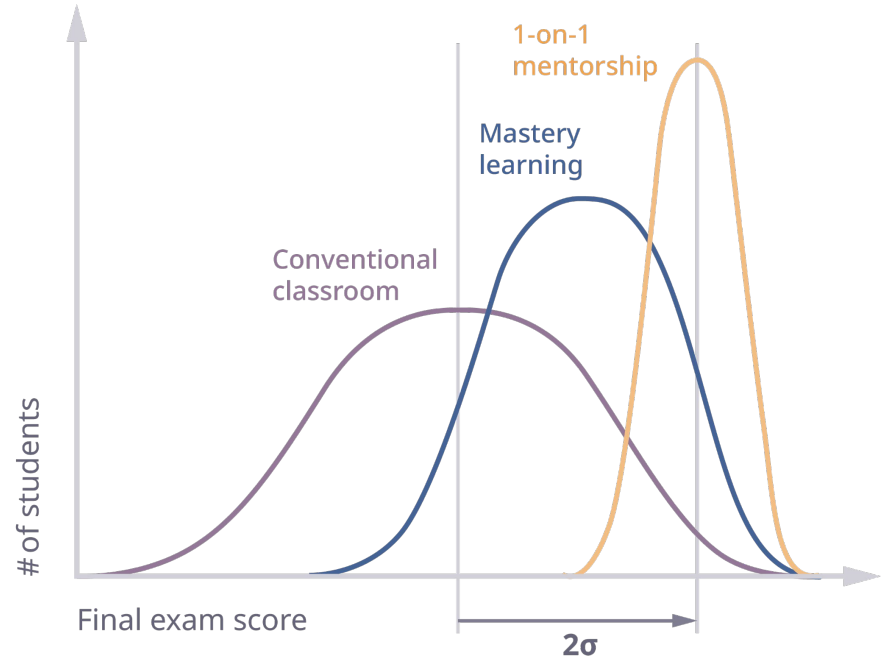
## We are probably familiar with **Bloom's Taxonomy**







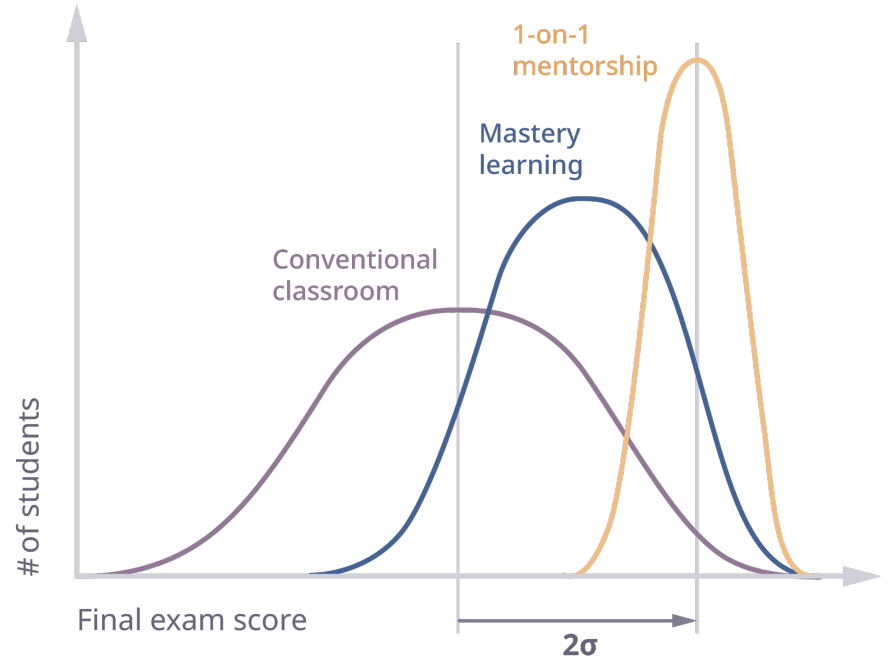
# But Are We Aware Of Bloom's 2 Sigma Problem?





# Bloom's 2 Sigma Problem

...refers to the educational phenomenon that the average student **tutored one-to-one** using mastery learning techniques performed **two standard deviations better** than students educated in a classroom environment.



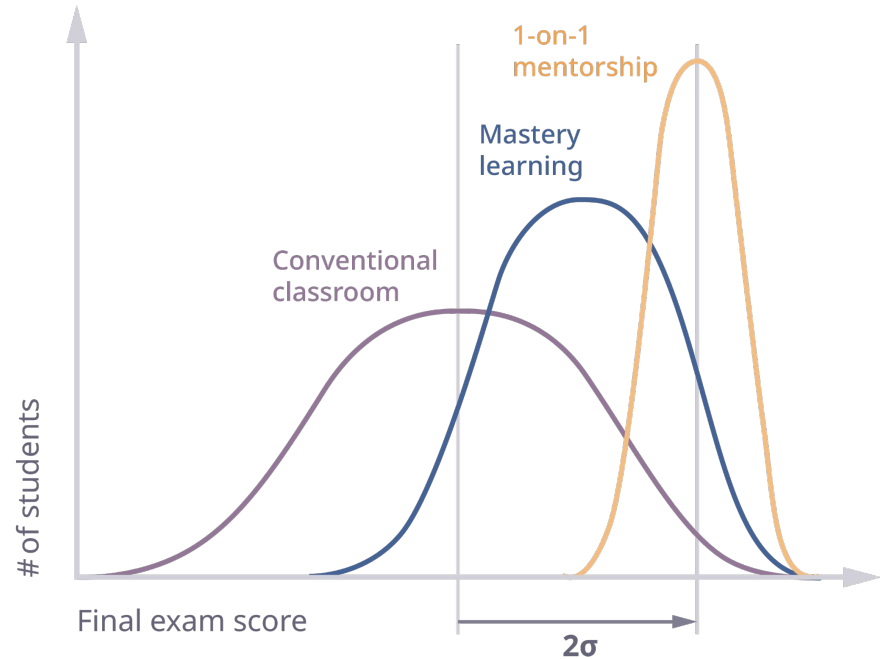


# Bloom's 2 Sigma Problem Highlights Potential AI Tutor Impact

## Mastery Learning

- Formative Assessment
- Feedback
- (Individualized) Corrective Instruction

When a learner makes an error, the tutor points out the error (feedback), and then follows up with further explanation and clarification (corrective) to ensure the student's understanding.



# Why Aren't We All Teaching 1:1?



Instructor shortages



Instructor time  
(especially practicing  
clinical physicians)



Student time  
(studying for exams  
and clinicals,  
residents, etc)



A student population  
who are now used to  
asynchronous and  
remote learning

# AI-Enabled Tutoring

= 1-to-1 tutoring for every student at any time

The screenshot displays a digital learning interface. On the left, a vertical sidebar shows a list of questions numbered 1 through 5. The main content area features a question titled "Question 1 of 5 ID: 27405" with a "Mark" icon. The question text reads: "In the obstetrics unit, a 32-year-old woman is in active labor. She has an acute outbreak of genital herpes, so a cesarean delivery will be performed. In addition to hemorrhage, what is the next most common complication that the patient should be educated about?". Below the text is a list of five multiple-choice options: A. Blood clot formation, B. Fetal trauma, C. Infection (selected), D. Postpartum depression, and E. Reaction to anesthesia. At the bottom of the question area are two buttons: "Submit answer and show explanation" and "AI Tutor".

On the right, a chat window titled "AI Tutor" is open. It contains the following text:

- AI Tutor: "Of all the risks associated with a cesarean delivery, this one is the most common in addition to hemorrhage. It is important for the patient to be educated about it."
- Student: "What would your answer be?"
- AI Tutor: "A: Blood clot formation"
- AI Tutor: "That's not the correct answer. While blood clot formation is a risk associated with cesarean delivery, there is another complication that is even more common in addition to hemorrhage. It is important for the patient to be educated about this particular complication. Keep thinking!"

At the bottom of the chat window, there is a list of the five multiple-choice options from the question, each in a separate button: "A: Blood clot formation", "B: Fetal trauma", "C: Infection", "D: Postpartum depression", and "E: Reaction to anesthesia".

# AI Tutoring Enables 1-1 Tutoring for Every Student at Any Time

The screenshot shows a user interface for an AI Tutor. At the top, there is a dark blue navigation bar with icons and labels for 'Auto Translate', 'Lab Values', 'Notes', 'Calculator', and 'Reverse color'. Below this is a white header area with a close button (X) and the title 'AI Tutor'. The main content area is a chat interface with a light green background. It features a large green message bubble from the AI Tutor containing text about cesarean delivery risks. Below this is a smaller green bubble with a robot icon asking 'What would your answer be?'. To the right, a dark blue button labeled 'A: Blood clot formation' is shown next to a user profile icon. A second large green message bubble from the AI Tutor provides feedback, stating that 'Blood clot formation' is not the correct answer and that another complication is more common. The interface includes thumbs-up and thumbs-down icons for feedback on both AI messages.

Auto Translate Lab Values Notes Calculator Reverse color

X AI Tutor

Of all the risks associated with a cesarean delivery, this one is the most common in addition to hemorrhage. It is important for the patient to be educated about it.

What would your answer be?

A: Blood clot formation

That's not the correct answer. While blood clot formation is a risk associated with cesarean delivery, there is another complication that is even more common in addition to hemorrhage. It is important for the patient to be educated about this particular complication. Keep thinking!

# Prior to AI

## Formative assessment & corrective instruction

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Question 32 of 40  
ID: 3410  
Mark

Previous Next

Auto Translate Lab Values Notes Calculator Reverse color

Cardiac muscle serves many necessary functions and it has a specific structure that serves these functions. The structure highlighted is an important histologic component of cardiac muscle. What would be the outcome if this structure diffusely failed to function?

- A. Inappropriate formation of cardiac valve leaflets
- B. Failure of propagation of the action potential from the conduction system
- C. Outflow tract obstruction
- D. Ineffective excitation-contraction coupling due to insufficient calcium ions
- E. Failure of potassium channels to appropriately open to repolarize the cell

Submit answer and show explanation

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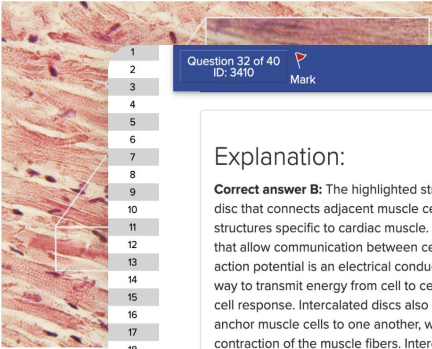


Image: by Dr. S. Girod, M.D.

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Question 32 of 40  
ID: 3410  
Mark

Previous Next



Auto Translate Lab Values Notes Calculator Reverse color

Explanation:

**Correct answer B:** The highlighted structure is an intercalated disc that connects adjacent muscle cells. Intercalated discs are structures specific to cardiac muscle. They serve as gap junctions that allow communication between cells. In cardiac muscle, the action potential is an electrical conductance—an incredibly fast way to transmit energy from cell to cell in order to coordinate a cell response. Intercalated discs also serve as desmosomes that anchor muscle cells to one another, which allows a strong contraction of the muscle fibers. Intercalated discs are characteristic structures within cardiac muscle which clearly delineates them from other types of muscle fibers.

**Option A:** Cardiac valves are not composed of muscle. They are part of a fibrous skeleton that gives structure to the softer tissues of the heart. Each valve has leaflets, the number depending on the valve in question. These leaflets are strong, collagenous structures that respond to the pressures of the heart chambers around them. Papillary muscles attached to chordae tendineae also open valves with the contraction of the heart muscle. That said, the leaflet structures are not composed of muscle. They do not have intercalated discs and do not directly respond to

Related Videos:

-  Cardiac Muscle  
04:57 min
-  Conducting System of the Heart  
04:14 min

Book References:

- First Aid for the USMLE Step 1 (2021, 31st ed):** 301
- First Aid for the USMLE Step 1 (2020, 30th ed):** 292
- First Aid for the USMLE Step 1 (2019, 29th ed):** 290
- First Aid for the USMLE Step 1 (2018, 28th ed):** 286, 233
- First Aid for the USMLE Step 1 (2017, 27th ed):** 433, 280

llecturio

Feedback End

# AI Tutor

Formative assessment + feedback + individualized corrective instruction

The screenshot displays the Lectorio AI Tutor interface. On the left, a vertical list of question numbers (1-40) is visible. The main content area shows 'Question 1 of 40 ID: z230'. The question text describes a 72-year-old man with a 50% stenosis of the left internal carotid artery and asks for the expected change in blood resistance through the stenotic artery. Five multiple-choice options are provided: A. It will double, B. It will be 4 times greater, C. It will be 8 times greater, D. It will be 16 times greater, and E. No change. Below the question are buttons for 'Submit Answer And Show Explanation' and 'Consult AI Tutor (Beta)'. On the right, a chat window titled 'AI Tutor (Beta)' shows a conversation: the AI provides a hint about factors affecting resistance, asks for the user's choice, and then provides corrective feedback when the user selects 'C' (8 times greater), explaining that resistance is inversely proportional to the 4th power of the radius. The AI congratulates the user when they select 'D' (16 times greater) as the correct answer.

Question 1 of 40 ID: z230

Previous Next

Auto Translate Lab Values Notes Calculator Reverse Color

A 72-year-old man arrives at the emergency department 30 minutes after developing rapid onset right-sided weakness and decreased sensation on the right side of his body. The patient's wife reports that he has had difficulty speaking coherent sentences. She adds that these symptoms intensified within a few minutes of the incident and began to resolve almost instantaneously. The patient says that about 3 months ago, he had an episode of painless visual loss in his left eye that resolved after about 10–20 minutes. His past medical history includes type 2 diabetes mellitus and essential hypertension. The patient reports a 50 pack-year smoking history. His blood pressure is 140/60 mm Hg and his temperature is 36.5°C (97.7°F). Neurological examination is significant for subtle weakness of the right hand. A contrast CT scan of the head is unremarkable, and a carotid Doppler ultrasound shows 10% stenosis of the right internal carotid artery and 50% stenosis of the left internal carotid artery. Regarding this patient's current symptoms, which of the following is the expected change to the resistance of blood flow through the stenotic artery?

A. It will double

B. It will be 4 times greater

C. It will be 8 times greater

D. It will be 16 times greater

E. No change

Submit Answer And Show Explanation Consult AI Tutor (Beta)

AI Tutor (Beta)

Hi Satria! Here's your first hint.

The resistance to blood flow through a vessel is determined by several factors, including the radius of the vessel. Think about how the stenosis of the internal carotid artery would affect the resistance.

Now, with the hint I've given you, what option do you think is the correct one?

C: It will be 8 times greater

Good effort, but that is not the correct answer. Remember, the resistance to blood flow is inversely proportional to the radius of the blood vessel to the 4th power. Think about how the stenosis of the internal carotid artery would affect the resistance. Keep trying!

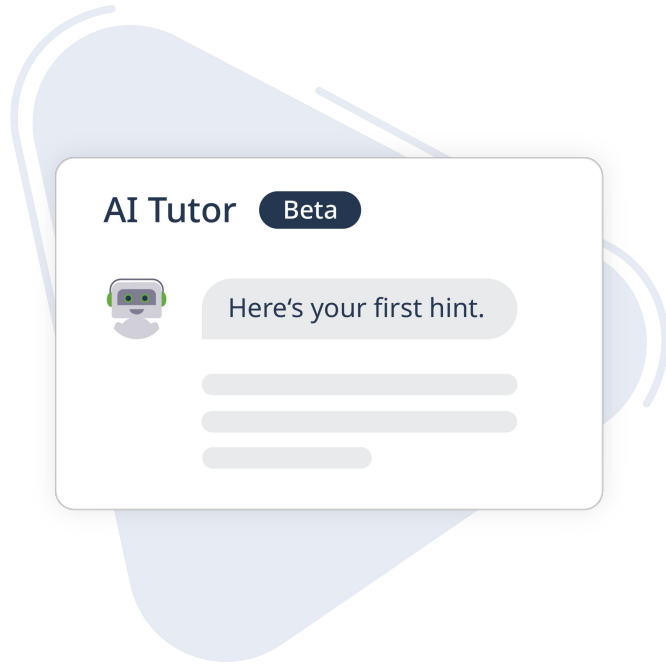
D: It will be 16 times greater

Congratulations! That is the correct answer. When a blood vessel is stenosed, the resistance to blood flow increases. In this case, the left internal carotid artery is stenosed by 50%, which means the radius of the vessel is reduced. Remember, resistance is inversely proportional to the radius of the blood vessel to the 4th power. Therefore, a blood vessel that is 50% stenosed has 16 times greater resistance to blood flow. Well done!

I hope I've been able to assist you well.

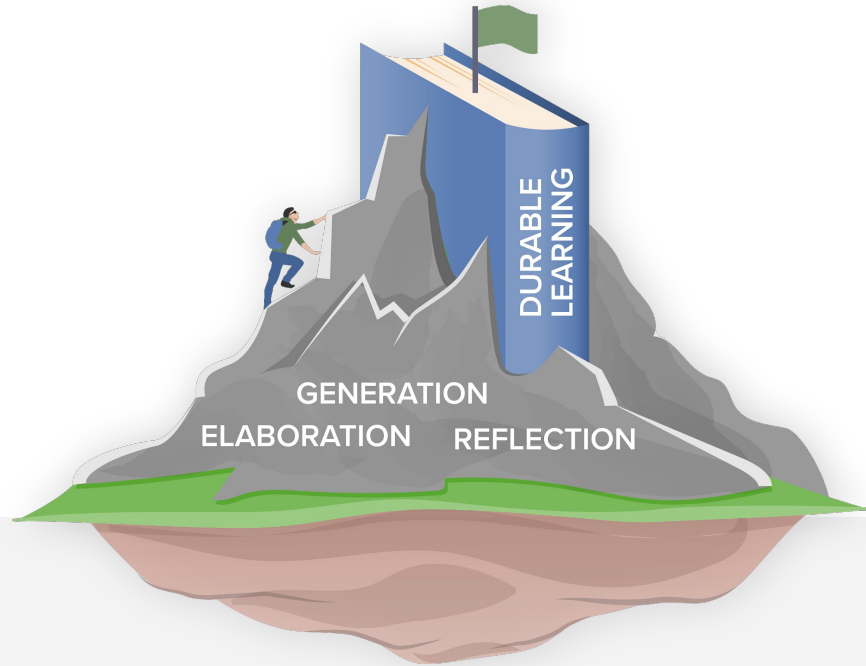
Feedback End





The **AI Tutor** provides clues and incremental hints instead of directly providing answers.

Students are encouraged to think about their answers (**Active Learning**) and compare answers to their own mental models (**Building Schemas**).



# Definition of Active Learning

**Instructional activities** that involve students in the delivery and encourage them to think about what they are doing<sup>1</sup>

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1. Bonwell CC, Eison JA. Active learning: creating excitement in the classroom. Washington, DC: School of Education and Human Development, George Washington University; 1991. 104 p. (ASHE-ERIC higher education report).



## Definition of Schemas

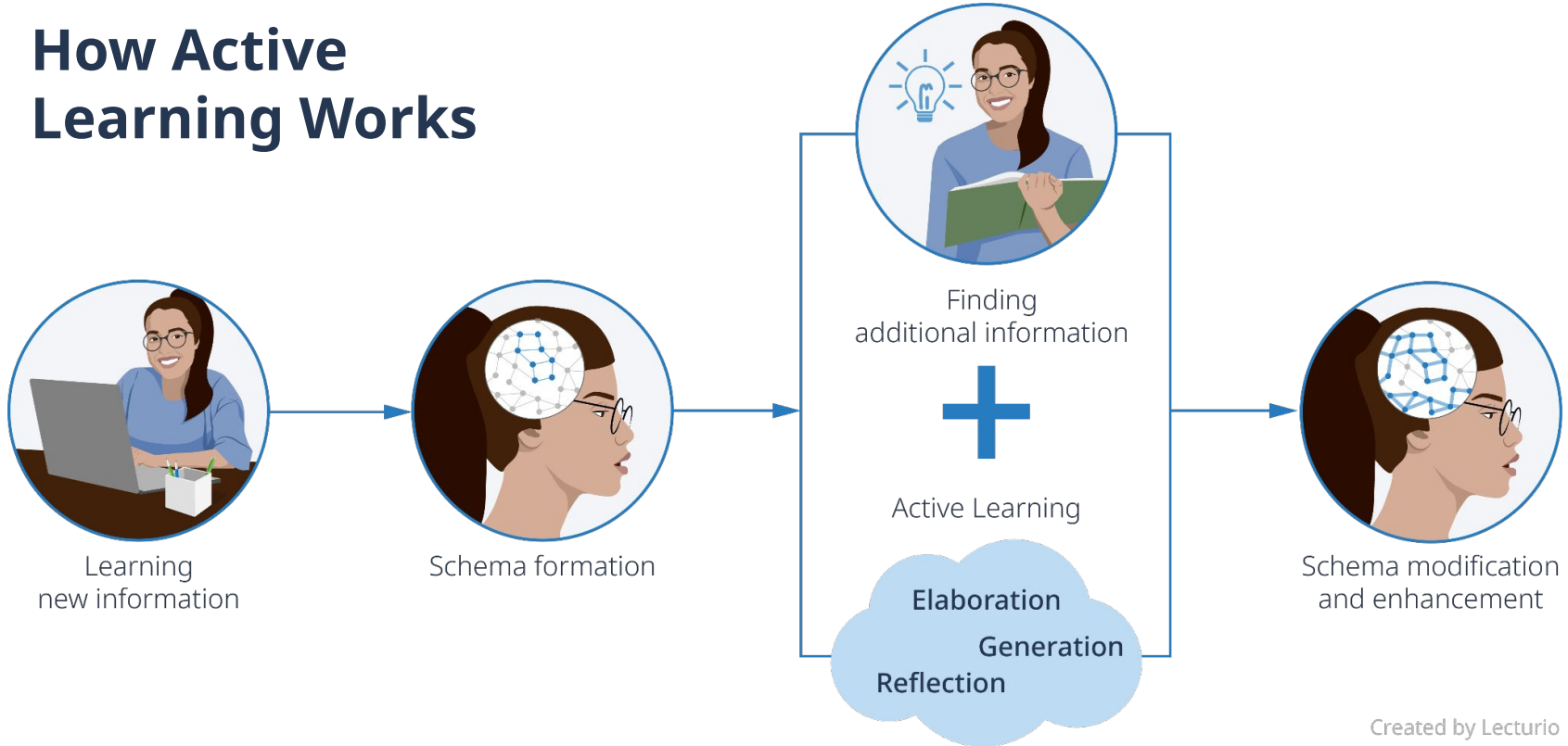
- **Mental models** that organize elements of information based on how they will be processed<sup>1</sup>
- Learners **build on and modify schemas** when they consume new information.<sup>2</sup>
- Very important for student-centered **active learning**<sup>3</sup>
- Well-developed schemas can lead to **easier retrieval of information**<sup>1</sup>

1. Qiao YQ, Shen J, Liang X, Ding S, Chen FY, Shao L, et al. Using cognitive theory to facilitate medical education. BMC Med Educ [Internet]. 2014 Dec [cited 2022 Nov 14];14(1):79. Available from: <https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-14-79>

2. Wadsworth, Barry J. Piaget's Theory of Cognitive and Affective Development: Foundations of Constructivism. White Plains, N.Y.: Longman Publishers USA; 1996.

3. Ruiter DJ, van Kesteren MTR, Fernandez G. How to achieve synergy between medical education and cognitive neuroscience? An exercise on prior knowledge in understanding. Adv in Health Sci Educ [Internet]. 2012 May [cited 2022 Nov 14];17(2):225–40. Available from: <http://link.springer.com/10.1007/s10459-010-9244-5>

# How Active Learning Works



Created by Lecturio

# Why Active Learning Works

## Cognitive Science

- Includes **higher-order thinking** and **metacognition**<sup>1</sup>
- May help reduce unnecessary **cognitive load** when recalling information<sup>2</sup>

## Neuroscience

- Allows for better **consolidation of neural links**<sup>3</sup>
- Fosters better **schema formation and modification**<sup>3,4</sup>

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1. Bonwell CC, Eison JA. Active learning: creating excitement in the classroom. Washington, DC: School of Education and Human Development, George Washington University; 1991. 104 p. (ASHE-ERIC higher education report).

2. Qiao YQ, Shen J, Liang X, Ding S, Chen FY, Shao L, et al. Using cognitive theory to facilitate medical education. BMC Med Educ [Internet]. 2014 Dec [cited 2022 Nov 14];14(1):79. Available from: <https://bmcmmeduc.biomedcentral.com/articles/10.1186/1472-6920-14-79>

3. Oakley B, EdD BR, Sejnowski TJ. Uncommon Sense Teaching: Practical Insights in Brain Science to Help Students Learn. New York: TarcherPerigee; 2021. 336 p.

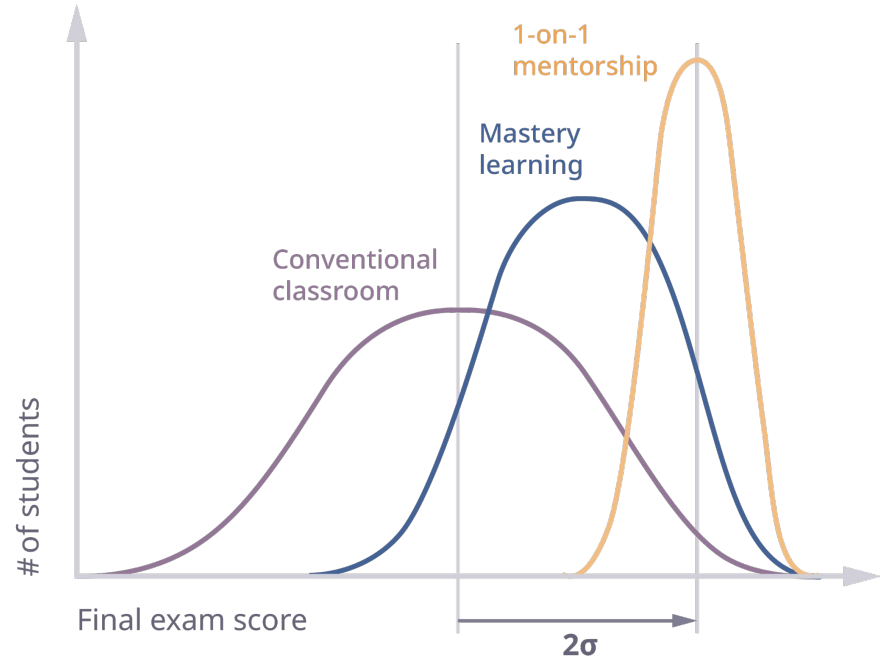
4. McKenzie S, Eichenbaum H. Consolidation and Reconsolidation: Two Lives of Memories? Neuron. 2011 Jul;71(2):224–33.



# AI Tutoring Can Solve Bloom's 2 Sigma Problem

## Mastery Learning

- Formative Assessment
- Feedback
- (Individualized) Corrective Instruction





# AI Tutoring Can Solve Bloom's 2 Sigma Problem

## Mastery Learning

- Formative Assessment
- Feedback
- (Individualized) Corrective Instruction

The screenshot shows a web application interface with a dark blue header containing navigation icons and labels: 'Auto Translate', 'Lab Values', 'Notes', 'Calculator', and 'Reverse color'. Below the header is a white chat window titled 'AI Tutor' with a close button (X). The chat contains three messages:

- A green message bubble from the AI Tutor: "Of all the risks associated with a cesarean delivery, this one is the most common in addition to hemorrhage. It is important for the patient to be educated about it." with thumbs-up and thumbs-down icons.
- A grey message bubble from the user: "What would your answer be?" with a small robot icon.
- A dark blue message bubble from the user: "A: Blood clot formation" with a user profile icon.
- A green message bubble from the AI Tutor: "That's not the correct answer. While blood clot formation is a risk associated with cesarean delivery, there is another complication that is even more common in addition to hemorrhage. It is important for the patient to be educated about this particular complication. Keep thinking!" with thumbs-up and thumbs-down icons.

# How AI Tutors Help Instructors Teach 1:1

## Challenges:



Instructor shortages



Instructor time  
(especially practicing  
clinical physicians)



Student time  
(studying for exams  
and clinicals,  
residents, etc)



A student population  
who are now used to  
asynchronous and  
remote learning







## Defining Generation

- An active learning strategy where students **integrate new information** with **existing knowledge** and experience<sup>1</sup>
- May involve the learner **generating a solution** or **defining concept for himself or herself** **before** or **in addition to** being taught a concept<sup>2</sup>
- Makes the mind **more receptive to new learning**<sup>3</sup>

---

1. Hall SM, Lieto J, Martin R. How Using Generative Learning Strategies Improved Medical Student Self-Competency in End-of-Life Care. TPJ [Internet]. 2018 Mar [cited 2022 Nov 4];22(1):17-064. Available from: <http://www.thepermanentejournal.org/doi/10.7812/TPP/17-064>

2. McCurdy MP, Viechtbauer W, Sklenar AM, Frankenstein AN, Leshikar ED. Theories of the generation effect and the impact of generation constraint: A meta-analytic review. Psychon Bull Rev. 2020 Dec;27(6):1139-65.

3. Brown PC. Make it stick: the science of successful learning. Cambridge, Massachusetts: The Belknap Press of Harvard University Press; 2014. 313 p.

# The Evidence for Generation



- Students generating and independently answering their own questions **achieved better retention.**<sup>1</sup>
- It has been found to work best when learners **produce material during the encoding process.**<sup>1</sup>
- Under an fMRI scan, it has been observed to cause **broader neural network participation** than simple reading.<sup>2</sup>

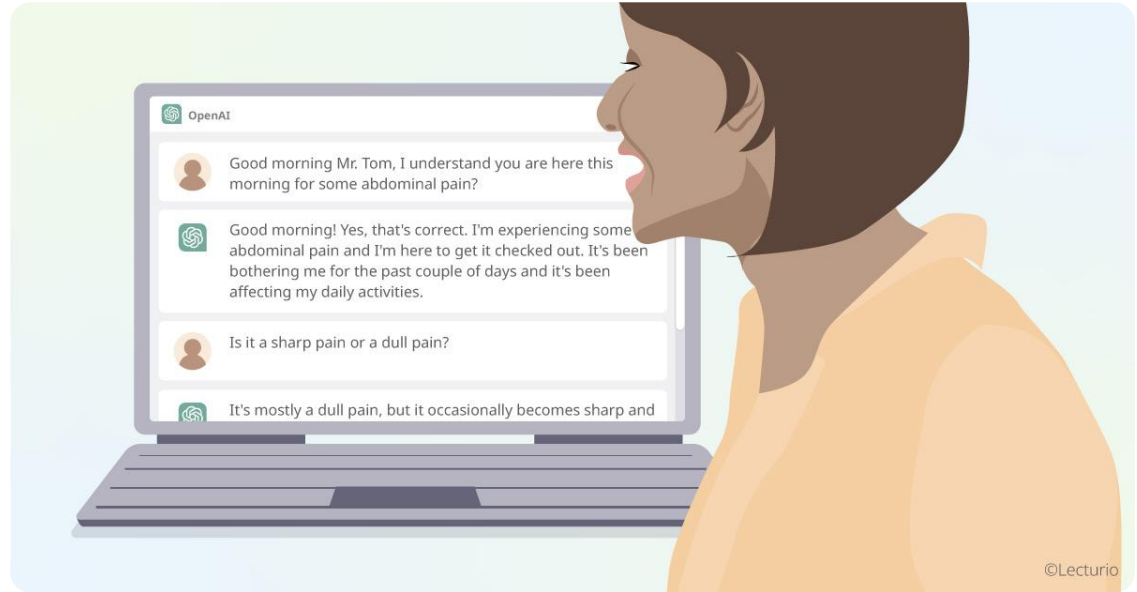
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1. McCurdy MP, Viechtbauer W, Sklenar AM, Frankenstein AN, Leshikar ED. Theories of the generation effect and the impact of generation constraint: A meta-analytic review. *Psychon Bull Rev.* 2020 Dec;27(6):1139–65.  
2. Brown PC. *Make it stick: the science of successful learning.* Cambridge, Massachusetts: The Belknap Press of Harvard University Press; 2014. 313 p.



AI in Med Ed:

# A User-Centered Future





# Prompt Engineering

Generative AI models can do amazing things.

But for most of us, getting them to do what we want them to do is extremely difficult.



Image from YouAI



## Simple Prompt

“Generate a set of flashcards on (insert medical topic). Each card should include the disease’s definition, common symptoms, risk factors, diagnostic tests, and current treatment guidelines.”

# Good Prompt

“As a final year medical student, you are preparing for your imminent exams, and revision is essential. To aid your studies, generate 50 Anki-style flashcards covering (insert topic). These flashcards will serve as a comprehensive review tool to test your knowledge and understanding. Each flashcard should be designed in a question-and-answer format, focusing on specific areas of medical knowledge.

The flashcards should address the following aspects for each medical topic during your revision:

- Definition and in-depth understanding of the disease or condition
- Key clinical and presenting features characteristic of the condition
- Relevant anatomical and physiological considerations related to the condition
- Important positive and negative aspects of the patient’s history that contribute to the diagnosis
- Abnormal clinical signs and findings associated with the condition
- Understanding the underlying causes and their role in formulating a diagnosis
- Application of risk assessment tools to evaluate the risk of disease development or complications
- Knowledge of relevant basic investigations and the ability to interpret their results

- Identification of the most appropriate further investigations or imaging modalities
- Formulation of a comprehensive management plan, including emergency measures if applicable
- Description of common therapeutic interventions, both pharmacological and non-pharmacological
- Understanding of specific medications, their routes of administration, mechanisms of action, and common side effects
- Awareness of disease prevention and health promotion strategies
- Familiarity with common symptoms, risk factors, diagnostic tests, and current treatment guidelines in the UK

Instructions:

You aim to revise: (insert medical topic).

Craft a question-and-answer flashcard based on the provided components. Each flashcard should detail the disease’s definition and in-depth understanding, key clinical and presenting features, relevant anatomical and physiological considerations, important positive and negative aspects of patient history, abnormal clinical signs and findings, understanding of the underlying causes and diagnostic formulation, relevant risk assessment tools, basic investigations, further investigations or imaging modalities, formulation of a management plan, common therapeutic interventions, specific medications, disease prevention and health promotion strategies, as well as familiarity with symptoms, risk factors, diagnostic tests, and treatment guidelines.”



# Prompting Tips

General prompt crafting guidelines

Be specific and descriptive

Break down tasks into chunks

Model the output with examples

Refine and experiment

Image based on  
workflowy.com



# Prompt Engineering

## More ideas:

- Copy prompts found online
- Trial and error
- Have a “prompt-a-thon”
- Explore prompt assistants such as Prompt Perfect
- Ask your computing, engineering, and data colleagues for assistance



Image from YouAI





# The Application Layer

## Futuring

In the very near future (12-18 months), most people will interact with LLM (ChatGPT, etc) through applications and interfaces.

Instead of this



Image from YouAI



# The Application Layer

## Futuring

In the very near future (12-18 months), most people will interact with LLM (ChatGPT, etc) through applications and interfaces.

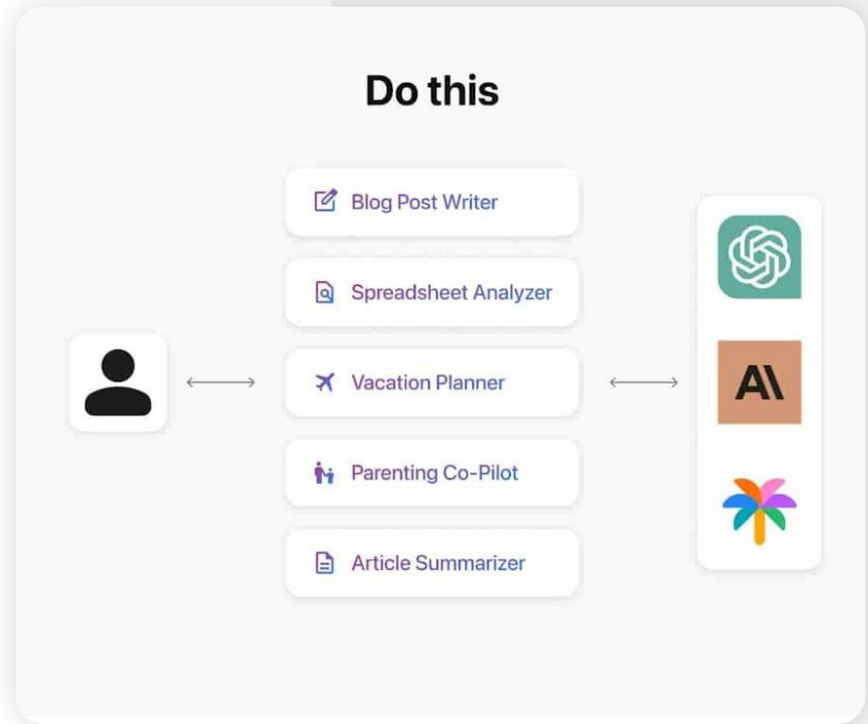


Image from YouAI



# The Application Layer



As a final year medical student, you are preparing for your imminent exams, and revision is essential. To aid your studies, generate 50 Anki-style flashcards covering varicose veins. These flashcards will serve as a comprehensive review tool to test your knowledge and understanding. Each flashcard should be designed in a question-and-answer format, focusing on specific areas of medical knowledge.

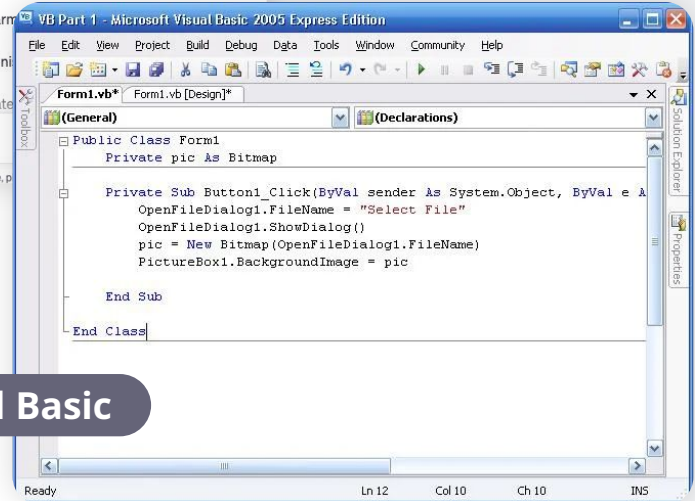
The flashcards should address the following aspects for each medical topic:

- Definition and in-depth understanding of the disease or condition
- Key clinical and presenting features characteristic of the condition
- Relevant anatomical and physiological considerations related to the condition
- Important positive and negative aspects of the patient's history that contribute to the diagnosis
- Abnormal clinical signs and findings associated with the condition
- Understanding the underlying causes and their role in formulating a diagnosis
- Application of risk assessment tools to evaluate the risk of disease development or complications
- Knowledge of relevant basic investigations and the ability to interpret their results
- Identification of the most appropriate further investigations or imaging modalities
- Formulation of a comprehensive management plan, including emergency measures if applicable
- Description of common therapeutic interventions, both pharmacological and non-pharmacological
- Understanding of specific medications, their routes of administration, and common side effects
- Awareness of disease prevention and health promotion strategies

Send a message

Free Research Preview. ChatGPT may produce inaccurate information about people, places, or events.

ChatGPT



Visual Basic

Image from Instructables

# The Two Sides of Precision Health Science Teaching

For Students

Personalized smart tutor

BOOKMATCHER Search CHANGE PLAN

Downloadable Slides

Learning Paths

Pharmacology Exam Prep

CONTINUE

Learning Objectives

Playlists

Notes

Explanation

Question Bank

24%

Spaced Repetition

Correct

Incorrect

Omitted

Total 2137

| Name | Risk Score | Accuracy |
|------|------------|----------|
|      | 10         | 13%      |
|      | 5          | 19%      |

For Faculty

Digital teaching assistant

Admin Dashboard

Watched Minutes

884

Viewed Concept Pages

367

Activity

Answered Qbank Questions

238 67% correct

Answered Recall Questions

285 48% correct

Performance

Total 2137

Correct

Incorrect

Omitted

Potentially At-Risk Learners

| Name | Risk Score | Accuracy |
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# The Application Layer: AI Question Writer in Lecturio

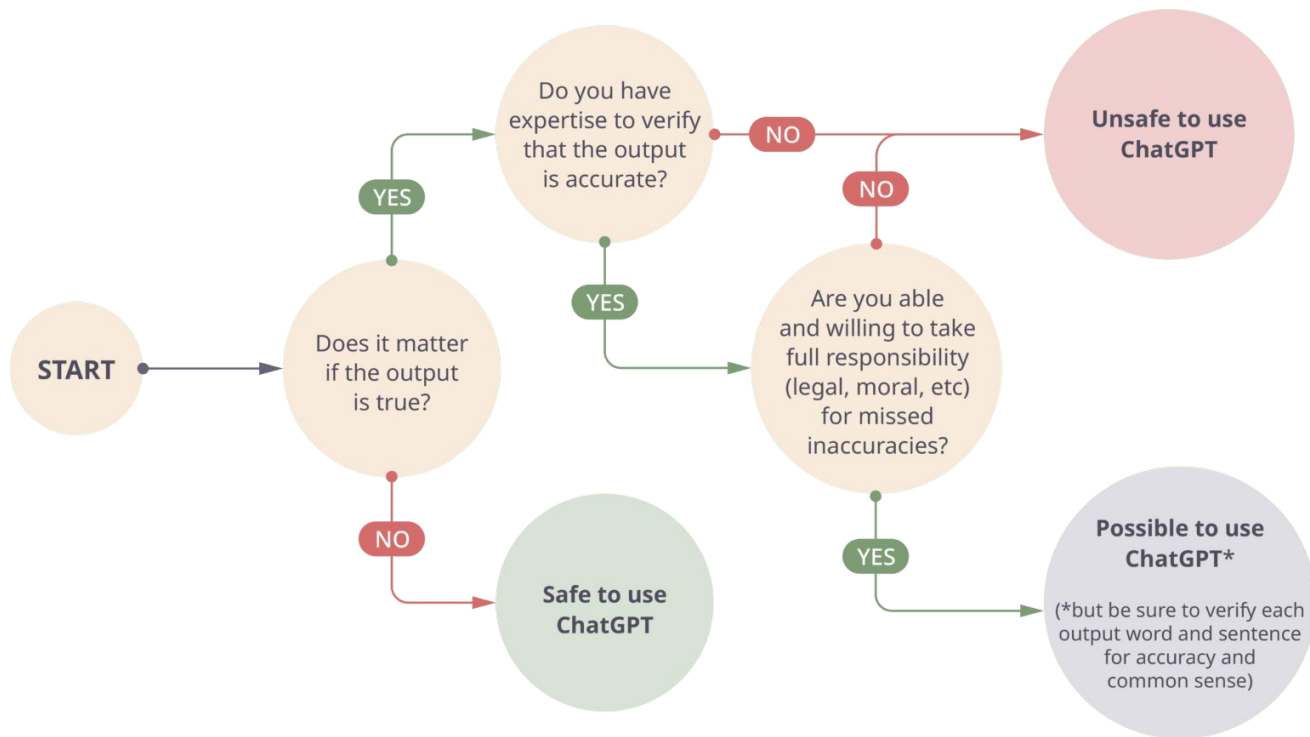


## Definition

AI Question Writer in Lecturio helps educators **write questions with AI**, in a way that is **fast, accurate**, and most importantly, **still fully under the educator's control / supervision**

# Is This Safe to Use?

## Alleviating Educator Worries



# Inside Lecturio

## What the AI question generator looks

The screenshot displays the Lecturio administration interface. On the left is a navigation sidebar under the heading 'ADMINISTRATION'. The 'Dashboard' menu item is highlighted in green. Below it, the 'AI Question Generator' menu item is highlighted with a red rectangular box. Other menu items include Statistics, Assignments, Library Management, Qbank Management, Test Management, Qbanks Visibility, Question Visibility, Create Questions, and Concept Pages. The main content area shows a 'Viewed Concept Pages' card with a value of 1,679 and an 'Answered Recall Questions' card with a value of 6,146 and a 47.12% correct rate. A line chart titled 'Activity' tracks 'No. of watched videos', 'No. of answered quiz questions', and 'No. of answered qbank questions' from November 2022 to October 2023. At the bottom, there are sections for 'Performance and Areas of Difficulty' and 'Subjects' vs 'Systems' selection.

ADMINISTRATION

- Dashboard
- Statistics
- Assignments
- Library Management
- Qbank Management
  - Test Management
  - Qbanks Visibility
  - Question Visibility
  - Create Questions
  - AI Question Generator**
- Concept Pages

Viewed Concept Pages

1,679

Answered Recall Questions

47.12% correct

6,146

Activity > Group

- No. of watched videos
- No. of answered quiz questions
- No. of answered qbank questions

Nov-2022 Dec-2022 Jan-2023 Feb-2023 Mar-2023 Apr-2023 May-2023 Jun-2023 Jul-2023 Aug-2023 Sep-2023 Oct-2023

Performance and Areas of Difficulty >

Subjects Systems

Qbank

https://acme.lecturio.com/js-app/admin/#/ai/q-gen



# Easy

## ← AI Question Generator

Subject

Anatomy

Question style

USMLE Step 1 Exam Question

Level of difficulty

Easy

Add additional details for question context

**Eye Anatomy:** The human eye is a sensory organ whose primary function is vision. The eye has a spheroidal shape and is structured in 3 layers: a supporting outer fibrous layer, a middle vascular layer, and an inner neural layer. The eye can also be subdivided into 3 compartments: the anterior, posterior, and vitreous chambers. Surrounding the eyeball itself are the extraocular muscles, the lacrimal apparatus, various nerves and vessels, and the bony structure of the orbit.

Add explanation to answers options

(RE) GENERATE QUESTION

Generated question

A 25-year-old patient presents with a sudden loss of vision in one eye. On examination, a retinal detachment is suspected. The retina is part of which layer of the eye and what is its primary function?



Answers 1

Retina is part of the outer fibrous layer and its primary function is to protect the eye.



Answers 2

Retina is part of the middle vascular layer and its primary function is to provide nourishment to the eye.



Answers 3

Retina is part of the inner neural layer and its primary function is to convert the light stimulus into a neural impulse.



Answers 4

Retina is part of the anterior chamber and its primary function is to regulate eye pressure.



Answers 5

Retina is part of the vitreous chamber and its primary function is to provide structural support to the eye.

GO TO MY QUESTION BANK

SAVE DRAFT

PUBLISH

(RE) GENERATE QUESTION

Generated question

A 25-year-old patient presents with a sudden loss of vision in one eye. On examination, a retinal detachment is suspected. The retina is part of which layer of the eye and what is its primary function?



Answers 1

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Answers 4

Retina is part of the anterior chamber and its primary function is to regulate eye pressure.



Answers 5

Retina is part of the vitreous chamber and its primary function is to provide structural support to the eye.



Paragraph

**B**

*I*

☰

☰

☰

☰

*I*\*

**Correct answer C:** The retina is part of the inner neural layer of the eye. Its primary function is to convert the light stimulus into a neural impulse, which is then carried by the optic nerve to the brain for interpretation. The intention of this question was to test the student's understanding of eye anatomy and the role of different layers in vision.

**Answer A** is incorrect because the outer fibrous layer primarily provides mechanical support and protection to the eye.

**Answer B** is incorrect as the middle vascular layer primarily provides nourishment to the eye.

**Answer D** is incorrect because the anterior chamber is involved in regulating intraocular pressure, not vision.

**Answer E** is incorrect as the vitreous chamber provides structural support to the eye, not vision.

**Learning Objective:** Students should be able to identify the different layers of the eye and understand their primary functions in vision.

tiny

# Difficult

## ← AI Question Generator

Subject  
Anatomy heart

Question style  
USMLE Step 1 Exam Question

Level of difficulty  
Hard

Languages  
English

Add additional details for question context

required to meet the body's needs. Signs and symptoms commonly include shortness of breath that worsens with physical exertion and lying down and lower-extremity edema.

Add explanation to answers options

(RE) GENERATE QUESTION

Generated question

A 65-year-old man with a history of hypertension and diabetes mellitus presents to the clinic with symptoms of shortness of breath, especially upon exertion, and swelling in his ankles. Based on the patient's symptoms and medical history, which of the following is the most likely diagnosis?

← AI Question Generator

- ✘ Answers 1  
Right-sided heart failure
- ✘ Answers 2  
Coronary artery disease
- ✘ Answers 3  
Congenital heart disease
- ✘ Answers 4  
Myocarditis
- ✔ Answers 5  
Diastolic heart failure

↶ ↷ Paragraph **B** *I* ☰ ☷ ☹ ☺ *I<sub>x</sub>*

Correct answer E: Diastolic heart failure. The patient's symptoms of shortness of breath, especially upon exertion, and lower-extremity edema are typical signs of heart failure. Given his age and medical history of hypertension and diabetes mellitus, diastolic heart failure is most likely. Diastolic heart failure, also known as heart failure with preserved ejection fraction, is characterized by the inability of the heart to fill adequately, resulting in decreased stroke volume and cardiac output. Answer A is not correct because right-sided heart failure typically presents with systemic symptoms such as edema, ascites, and hepatomegaly. Answer B is incorrect because although coronary artery disease could lead to heart failure, it would typically present with chest pain or angina. Answer C is not correct as congenital heart diseases usually present earlier in life. Answer D is not correct because myocarditis typically presents with a recent history of infection, chest pain and signs of inflammation. Learning Objective: The goal of this question is to understand the signs and symptoms of heart failure and to differentiate between systolic and diastolic heart failure.

[GO TO MY QUESTION BANK](#) [SAVE DRAFT](#) [PUBLISH](#)



Nanayakkara C. A Model of User Acceptance of Learning Management Systems. The International Journal of Learning: Annual Review. 2007;12(12):223–32.

# Why Applications Such as Lecturio's AI Question Generator Are Important

A study identified **5 essential factors** for uptake of technology in a higher education setting:

1. **Release time for staff**
2. Ease of Use of LMS
3. Usefulness of the LMS
4. **Training and Support to develop online content**
5. Reliability of the technology

**AI Question Generator helps teachers develop online content and helps reduce the need for release time for staff.**

Would you like more information about being a beta tester for the AI Question Writer?

- a. Yes, please contact me
- b. Not right now

## Poll 3



# Recommendations for Educators

# Known Challenges

1

## Trust

Not sure if I can trust the sources or the output

2

## Privacy

Data Privacy concerns (student data, patient data)

3

## Integrity

Plagiarism and Academic Integrity

4

## Decision Making

How are algorithms making decisions?  
“Black box” problem





## Trust

**Not sure if I can trust the sources or the output**

**Discuss reliability of sources with learners.** Ask them to use an LLM such as ChatGPT and then to **critique and confirm the results.**

Always check and verify any content you produce with an LLM.

Teach students machine learning. The more they know about algorithms and how to define the variables, the better their understanding will be.

**Using an application such as Lecturio's AI Question Writer?**

As the instructor and resident expert, we encourage you to verify the results.



# Privacy

Data  
Privacy concerns  
(student data,  
patient data)

**Don't put protected data into an open LLM!** (patient data, student grades, or residency applications, for example)

Teach everyone in your organization, including students, about privacy concerns with LLMs and AI.

If you want to use AI for sensitive and protected data, consider a "private instance" and discuss with your institution's data protection officer.



# Integrity

## Plagiarism and academic integrity

**Explore a broader vision of academic integrity and human contributions**

Example: Ask students to develop a complex prompt for study materials or cases

Example: Assign learners to design prompts and produce patient notes, case studies, etc. outside of class, then critique and correct the results (their own or others) during class



# Decision Making

How are algorithms making decisions?  
“Black box” problem

- Add machine learning to the curriculum
- Invite data scientists and engineers to the conversation
- Explore the nuances of algorithmic decision making to reduce bias
- Beware of coding your existing biases into the algorithm
- **Acknowledge that human decision making is also a “black box”**



# Resources to Explore

## Newsletters and Journals:

Health Care AI News: <https://www.HealthCareAINews.com/>

New England Journal of Medicine AI: <https://ai.nejm.org/>  
(coming soon)

## Writing Good Prompts:

<https://workflowy.com/systems/chatgpt/>

<https://learnprompting.org/docs/intro>

## Teaching with ChatGPT:

<https://help.openai.com/en/collections/5929286-educator-faq>

What other AI topics are you interested in and would like us to present about in the future?

**Question**

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Personalized smart tutor

BOOKMATCHER Search CHANGE PLAN

Downloadable Slides

Learning Paths  
Pharmacology Exam Prep  
CONTINUE

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Book References

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| Count | Difficulty |
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| Name   | Risk Score | Accuracy |
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| [Name] | 10         | 13%      |
| [Name] | 5          | 19%      |



# The Next-Generation Precision Health Science Teaching Platform

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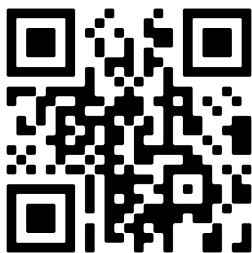
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