

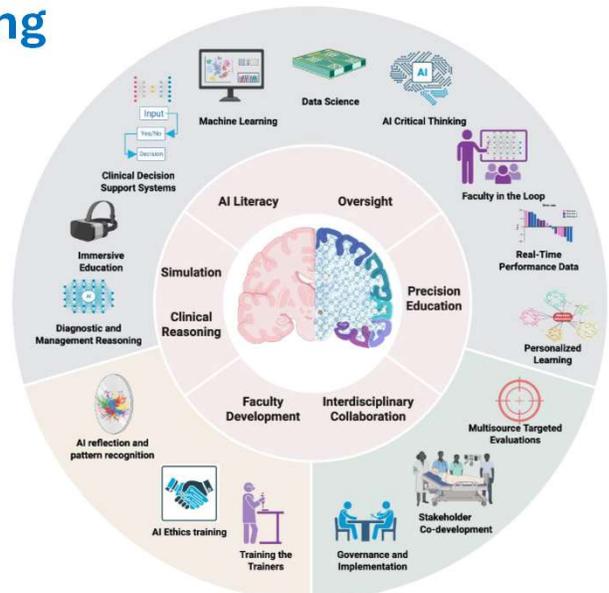
1

Learning objectives

1. **Identify** key applications of AI in medical education
2. **Apply** effective prompt engineering techniques
3. **Utilize** AI tools for clinical engagement and education
4. **Explore** generating educational content

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Complexities of Integrating AI in Education



Khoury P. Preparing Allergists to Practice in 2050 using AI. *JACI In Practice* 2025

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AI possibilities in MedEd

- Curriculum development (syllabi, learning objectives, cases/vignettes)



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AI possibilities in MedEd

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- Learning activity development (virtual simulation, personalized chatbots or intelligent tutoring systems)



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AI possibilities in MedEd

- Curriculum development (syllabi, learning objectives, cases/vignettes)
- Learning activity development (virtual simulation, non-examples, personalized chatbots or intelligent tutoring systems)
- Assessment & evaluations (MCQs, summarize feedback, rubrics, analyzing narrative text (ie notes))

A 42-year-old woman presents with **persistent eosinophilia** (absolute eosinophil count 3,600/ μ L), fatigue, and new-onset headaches. She reports pruritus after hot showers. Examination reveals **mild splenomegaly**. A bone marrow biopsy shows **eosinophilic hyperplasia** with increased myeloid proliferation but no excess blasts.

Which of the following variants is most consistent with her presentation?

- A. *JAK2 V617F*
- B. *PDGFRA* fusion
- C. *KIT D816V*
- D. *STAT5B*

Correct Answer: A. *JAK2 V617F*

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AI possibilities in MedEd

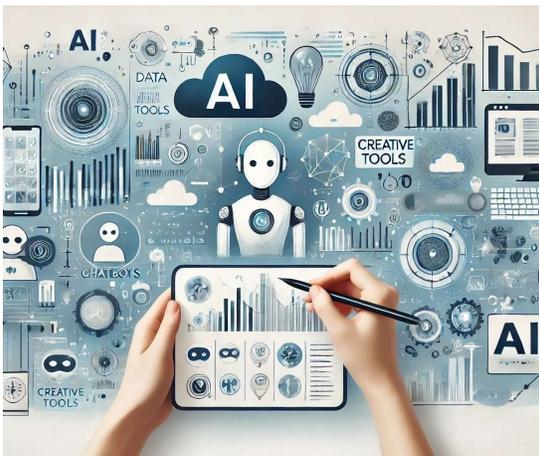
- Curriculum development (syllabi, learning objectives, cases/vignettes,)
- Learning activity development (virtual simulation, non-examples, personalized chatbots or intelligent tutoring systems)
- Assessment & evaluations (MCQs, summarize feedback, rubrics, analyzing narrative text (ie notes))
- Recruitment, Admissions, etc.

The screenshot shows the Cortex application interface. At the top, there are navigation tabs: Program ID, Applications, Assignments, Applicant Info, Score, Keywords, Binders, Scored Facts. Below this is a search bar with filters for Name, APPLICANT INDEX, SCORES, SEARCH, and RUSSE SCORE. The main content area displays a profile for Henry Hastings, a student at the Medical School of Central University College of Medicine. The profile includes a photo, a list of courses with scores, and a list of standardized exam scores (USMLE Step 1-3, Step 2 CK, Step 2 CS, Step 3).

Course Name	Score	Grade	Percentile
Core Clerkship	A	A	75
Internal Med	A	A	75
Surgery	A	A	85
Pediatrics	B	B	75
OB/GYN	A	A	85
Psychiatry	B	B	75
Neurology	A	A	85
Family Med	A	A	85

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Tools for clinical engagement and education



LLMs

- ChatGPT, OpenEvidence, Claude, Gemini

Chatbots

- Adobe AI assistant, UpToDate Expert AI

Podcast, video generation

- Notebook LM

Avatars

- HeyGen

Summarization

- LLMs, Perplexity

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Prompt Engineering

The better the prompt the more specific the output

Specify role, task, audience, and format

"You are an asthma educator" "You are an academic scientist..."
 "You are presenting to allergist-immunologists from AAAAI who are interested in utilizing AI for productivity"
 Produce a 5-slide outline... Produce a table with the following column headings...

Use constraints

word count, audience, any requirements "e.g provide citations, provide a ppt slide"

Provide examples by pasting in the format, tone you want to reproduce

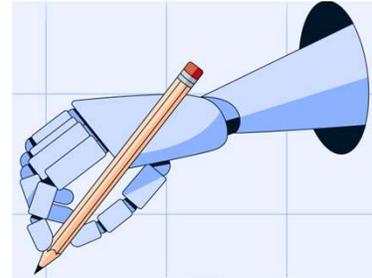
"Use this document as an example"
 "Use my prior letter of recommendation style/format as a guide for tone"
 "Follow this CV style"
 "Tone=funny, quirky, serious"

Request step-by-step reasoning or options

"Give me two versions," "reduce word count to 500 words, without changing content,"

Iterate

refine with "exclude, expand, change, revise," or "focus only on..." rather than restarting.



Zero-shot prompts: more creative outputs

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Orienting the AI during Prompts

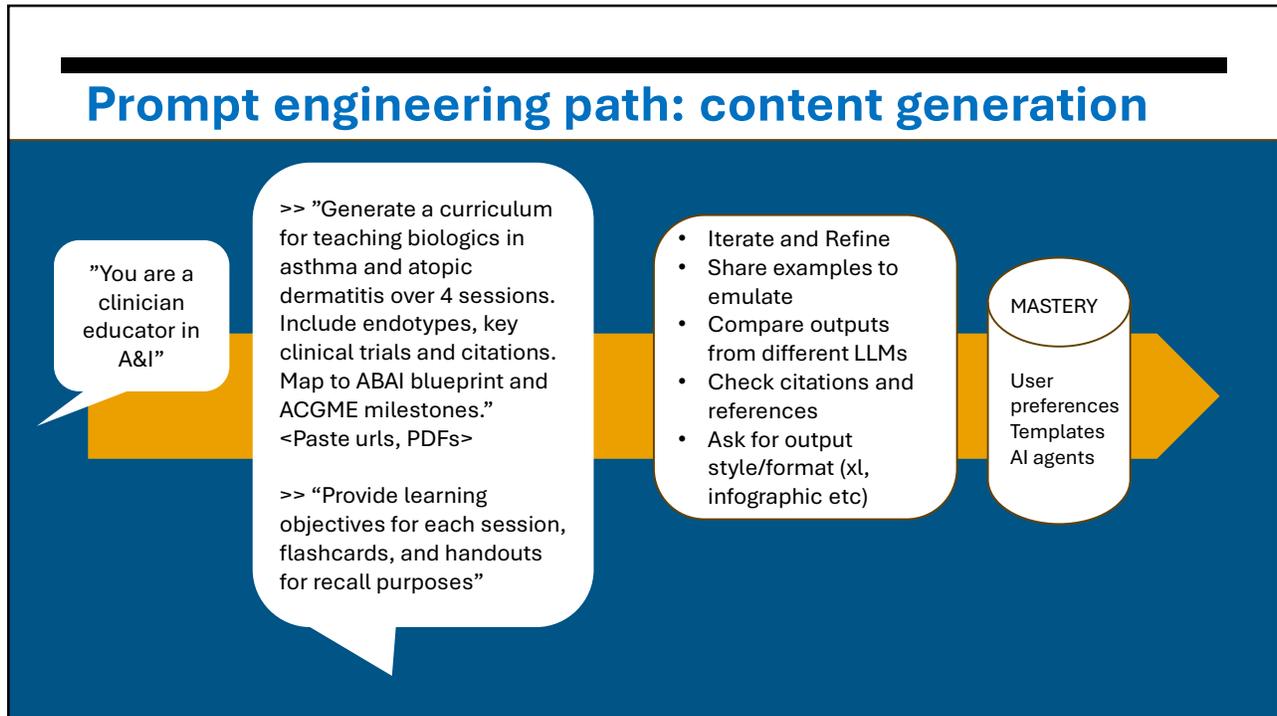
Based on Accreditation Standards

- ABAI competencies
- Knowledge Corpus (Middleton's, Abbas)
- Course organization (e.g. Allergy/Immunology Clinical Rotation Curriculum)

Based on Learning Pedagogy

- Active Learning strategies
- Simulation
- Serious Games
- Problem Based Learning
- Clinical or Management Reasoning
- Master Adaptive Learner
- Curriculum alignment

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AI for summarization and content creation

- Current strengths reside in summarizing well-established and documented knowledge on which LLMs were trained
- Specific corpus, or document repositories:
 - OpenEvidence
 - Uptodate ExpertAI
 - NotebookLM
 - ClinicalKey (Elsevier)

OpenEvidence
Featuring multimedia and clinical findings from The New England Journal of Medicine, JAMA Network, and Mayo Clinic Platform Accelerator program.

NotebookLM
World class *clinical information* meets artificial intelligence. Upload sources: Drag & drop or choose file to upload.

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Generating Educational Content

"LLMs can go off track..."

"Outputs are not reflective of the level of learner"

• When generating MCQ's using LLMs it helps to:

- 1st generate/input a specific case
 - Can use OpenEvidence to write the case
- **THEN** use prompt chains (iteration) to prompt LLM to:
 - develop Qs for the level of learner
 - Adjust for difficulty
 - Generate 1st order, 2nd order questions, etc

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Case presentations

<instructions> i'd like for you to create a case scenario that would lead to a VUS of JAK1 deficiency <example> 34 yo... and <formatting> put in the format of a morning report session for medical residents

Use XML tags to specify:

<instructions>

<example>

<formatting>

- Separates parts of prompt
- Prevents the LLM from mixing up instructions with examples or context



Morning Report: Case Scenario

Chief Complaint:

34-year-old female presents with recurrent infections and unexplained fatigue over the past year.

History of Present Illness:

The patient, previously healthy, reports a one-year history of recurrent sinus infections, bronchitis, and occasional skin abscesses. She has been prescribed multiple courses of antibiotics, which provide temporary relief. Over the past 6 months, she also noticed episodes of low-grade fever, night sweats, and progressive fatigue. There is no history of weight loss, cough, or gastrointestinal symptoms.

She denies any recent travel, known sick contacts, or high-risk exposures. There is no history of autoimmune disease or malignancy. Family history is significant for rheumatoid arthritis in her mother and an uncle with an unspecified primary immunodeficiency disorder.

Past Medical History:

- Mild asthma in childhood, no hospitalizations.
- No known allergies.
- No previous surgeries or significant illnesses.

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...an example

<Pretend you're a medical educator> <I'd like you to create a patient case scenario for a patient with CRSwNP> <Give a step by step diagnostic challenge, as in NEJM Case presentations of MGH, e.g. URL: <https://www.nejm.org/doi/10.1056/NEJMc008293/full/>>. Don't give away the answer right away, allow iterative question and answers.

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NotebookLM
← YouTube URL
Paste in a YouTube URL below to upload as a source in NotebookLM
Paste YouTube URL: <https://www.youtube.com/watch?v=Bg4nfc3LNSX>

Patch Testing Essentials for Allergic Contact Dermatitis

The source material is a detailed medical conference presentation delivered by Dr. L. Fonacier, an expert in Allergy and Immunology, discussing the etiology and clinical management of contact dermatitis. The lecture emphasizes the necessity of patch testing to correctly diagnose allergic reactions and distinguish them from irritant causes, noting the limitations of using only limited screening panels compared to expanded series. Dr. Fonacier reviews the most frequent locations for dermatitis and their associated common allergens, including those found in clothing (like textile dyes and formaldehyde resin) and personal care products. Specialized topics addressed include systemic contact dermatitis, which is caused by non-cutaneous exposure to common allergens like nickel and Balsam of Peru, and the growing concern of metal allergy associated with biomedical device implants. Ultimately, the presentation stresses that accurate diagnosis via testing and providing the patient with an avoidance plan and a safe list are essential for effective treatment.

Save to Note | Share | Embed

Video Overview | Audio Overview | Mind Map

What are the characteristics of a patch result and how do you know if its positive versus irritant?

The characterization of a patch test result hinges on the physical appearance and whether the reaction shows signs of infiltration and edema 1. Erythema (redness) alone is **not considered positive** 2.

Characteristics of a Positive (Allergic) Reaction

A true allergic reaction must exhibit **infiltration and edema** in addition to erythema 1. Allergic morphology can include the following:

- **Papules, vesicles, and bullae**—These are considered a three plus (3+) reaction 1.
- **Infiltration and Edema:**
 - A **two plus (2+)** reaction usually fills up the **whole application side** 1.
 - A **one plus (1+)** reaction covers about **1/2 to 2/3 of the application side** 1.
- **Timing:** Most true allergic reactions occur between **72 and 96 hours** 3. An increasing reaction (acceleration) seen at the 72 to 96-hour read, especially if preceded by a marginal reaction at 48 hours, suggests it may be allergic 3.

Differentiating Positive (Allergic) vs. Irritant Reactions

Differentiation is crucial, as some irritant reactions can mimic or precede true allergic reactions, and some reactions are considered "false positive" or toxic effects 1, 2.

Feature	Irritant Reaction Characteristics	Allergic Reaction Characteristics
Morphology	May have pustules (psts), scaling, peeling, or shiny skin 2.	Must have infiltration and edema ; may involve papules, vesicles, or bullae 1.
Palpation	Discoloration (e.g., dark brown/black from p-phenylenediamine or pigmentation from dispersed dye) will be visible but not palpable 1.	Marginal reactions (+/- or +1) are palpable 2; infiltration and edema are clearly palpable 1.
Reaction Site	The "cigarette paper appearance" is a common irritant reaction to metals 2; Reaction usually involves the entire	

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NotebookLM

Upload sources
Drag & drop or choose file to upload

Supported file types: PDF, .txt, Markdown, Audio (e.g. mp3), .docx, .avif, .bmp, .gif, .ico, .jp2, .png, .webp, .tif, .tiff, .heic, .heif, .jpeg, .jpg, .jpe

Podcasts

Audio overview
Deep dive conversation (Two hosts, English only) [Generate]

Q&A

Suggested questions
What is the main contribution of the "Attention is All You Need" paper to the field of natural language processing?
What are the limitations of recurrent neural networks in sequence modeling and how does the Transformer overcome them?
How does the Transformer perform on different NLP tasks, and what are the implications of its results for future research?

Studio

- Audio Overview
- Video Overview
- Mind Map
- Reports
- Flashcards
- Quiz
- Infographic (BETA)
- Slide Deck (BETA)

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NotebookLM: So many uses...

BETA Infographic

The Anatomy of a Powerful Prompt

- 1. Assign a Persona & Audience**
Specify the AI's role and who the content is for (e.g., "You are an asthma educator presenting to fellows").
- 2. Define the Task & Format**
Clearly state your objective and the desired output (e.g., "Produce a table," "Generate a 5-slide outline").
- 3. Provide Context & Examples**
Guide the AI's style and tone by providing your own documents, text examples, or desired constraints.

PROMPT BUILDER

The Path to Mastery

- Ground the AI in Your Knowledge**
Orient the AI using specific documents like accreditation standards, textbooks, or clinical curriculum PDFs.
- Iterate, Don't Restart**
Refine outputs with commands like "expand," "revise," or "focus only on..." instead of starting over.
- Always Verify the Output**
Remember that LLMs can go off track; always check citations, references, and facts for accuracy.

© NotebookLM

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UpToDate Expert AI (beta)

The screenshot displays the UpToDate interface for the topic "Chronic spontaneous urticaria: Treatment of refractory symptoms". The page includes a navigation menu on the left with sections like "SUMMARY AND RECOMMENDATIONS", "INTRODUCTION", "REFERRAL", "OVERVIEW", "OMALIZUMAB", and "REMBRUTINIB". The main content area features an "INTRODUCTION" section defining Chronic Spontaneous Urticaria (CSU) and discussing treatment options. A "REFERRAL" section provides guidance on when to refer patients to an allergist or dermatologist. The article is authored by David A Khan, MD, and includes a "Contributor Disclosures" section.

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Saving time with AI for Content and Idea Generation

- Image/Graphics and Presentation tools
 - e.g. Canva, DALL-E, Midjourney, GoogleImageFX, etc
- For Research/Scholarly work:
 - Perplexity (concise source-linked summaries + idea generation tools), MedEdMentor (pedagogy linked to AI), ResearchRabbit (project and literature mapping), SemanticScholar, Scite, and many more...



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YOUR TURN



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1

Curriculum or Block Schedule Builder (LLMs)

Learning Objective: Identify how LLMs can support block schedule and curriculum planning

Options:

- * Paste in the ABAI Certification Examination Blueprint (from the ABAI website, or point to URL)
- * Copy/paste the Table of Contents from Middleton's Allergy or Abbas' Cellular and Molecular Immunology
- * Paste in your existing or prior years lecture schedule

Play with Prompt structure:

"You are a AI program director and educational guru". Using spaced repetition and interleaving, use the following curriculum anchor (ABAI Blueprint , textbook Table of Contents):

1. Summarize major strengths and gaps in the curriculum schedule from last year.
2. Map curriculum topics to ABAI Topics, suggest areas that have not been covered.
3. Propose an improved weekly schedule organized by week, provide learning objectives, suggested readings/references, and optimal teaching methods (journal club, flipped classroom, etc).
4. Create a reading list aligned with the week-by-week objectives.

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2

MCQ Generation and Study Enhancement

Learning Objective: Evaluate and edit AI-generated MCQs for accuracy, fairness, and alignment with milestones.

Options:

*Turn on temporary chat in **ChatGPT** (top right button) and paste in de-identified ITE results

*Using **OpenEvidence**, paste incorrect ITE questions

*Using **NotebookLM** paste in de-identified ITE, or topic of choice

Play with Prompts/Tools:

“Provide a rationale for the correct answer, and why the other choices are wrong”

“Map each MCQ to ACGME Milestones”...or

“Map to relevant AAAAI/JTF or similar Practice Parameter or guideline” ...or

“Map to corresponding pages/figures of Abbas/Middleton’s for pathophysiology”

Using NotebookLM, generate flashcards, study guides

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3

Creating Study Guides, Podcasts, Guideline Summaries, Simulated cases

Learning Objectives: Use NotebookLM and OpenEvidence to generate educational outputs (study guides, scripts, podcasts) from PD-uploaded documents.

Options:

*Upload a deidentified source (e.g., a fellowship orientation document, block objectives, PDF chapter) to **NotebookLM**

*Ask **OpenEvidence** to summarize a guideline

Play with Tools/Prompts:

1) NLM: “Create a structured study guide covering key points, definitions, and clinical applications. Then draft a 5-minute podcast script explaining the topic to a first-year fellow.”

2) OE: “Using the GINA guidelines for 2025, provide PD level teaching with 1) Key recommendations/changes from prior version, 2) a clinical case that illustrates guideline application, and 5 MCQs”

3) ChatGPT: “Create a simulated case for a patient with GATA2 deficiency ala Cases of Mass General, allow us to ask for more details to refine the ddx. Do NOT suggest which labs, imaging or categories of information I should ask for next (only if asked). Do NOT mention specific tests, labs, imaging studies, or prompt diagnoses unless I request them. Upon reaching the correct (or final) diagnosis provide a summary and explanation of the case.” **If the LLM messes up, ask how you can better prompt it to not give the diagnosis/tests away!

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