Reimagining HPE with AI

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My biases

- I'm generally optimistic about the use of generative AI, which colours what I choose to talk about
  - There are many other directions this presentation could go in
- A lot of the research presented here is very early stage and experimental. Treat results with caution
- Focused on positive and practical implications, not ethics concerns
- I used to think AI would help me be a better academic; now I think it helps me be a *different* academic

“It can feel as though no one truly understands you or your struggles, leaving you feeling like an outsider in your own life. You may try to reach out to others, but find that your attempts at connection fall flat or are met with indifference. This can lead to feelings of hopelessness and despair, as though you are destined to be forever alone.”

https://chat.openai.com/chat

Generative AI

- GenAI is a next-word-predictor
- GenAI is multimodal (text, audio, image, video)
- GenAI is increasing in competence
  - 6 months ago: Generative AI can’t do X
  - Today: X is trivial
- GenAI is everywhere: operating systems, software, cars, phones
  - I think of it as intelligence-on-demand; free for everyone
- Bigger context windows, RAG, and MoE for more accurate responses to increasingly complex prompts

How might these tools help us shift from content delivery to supporting learning processes?

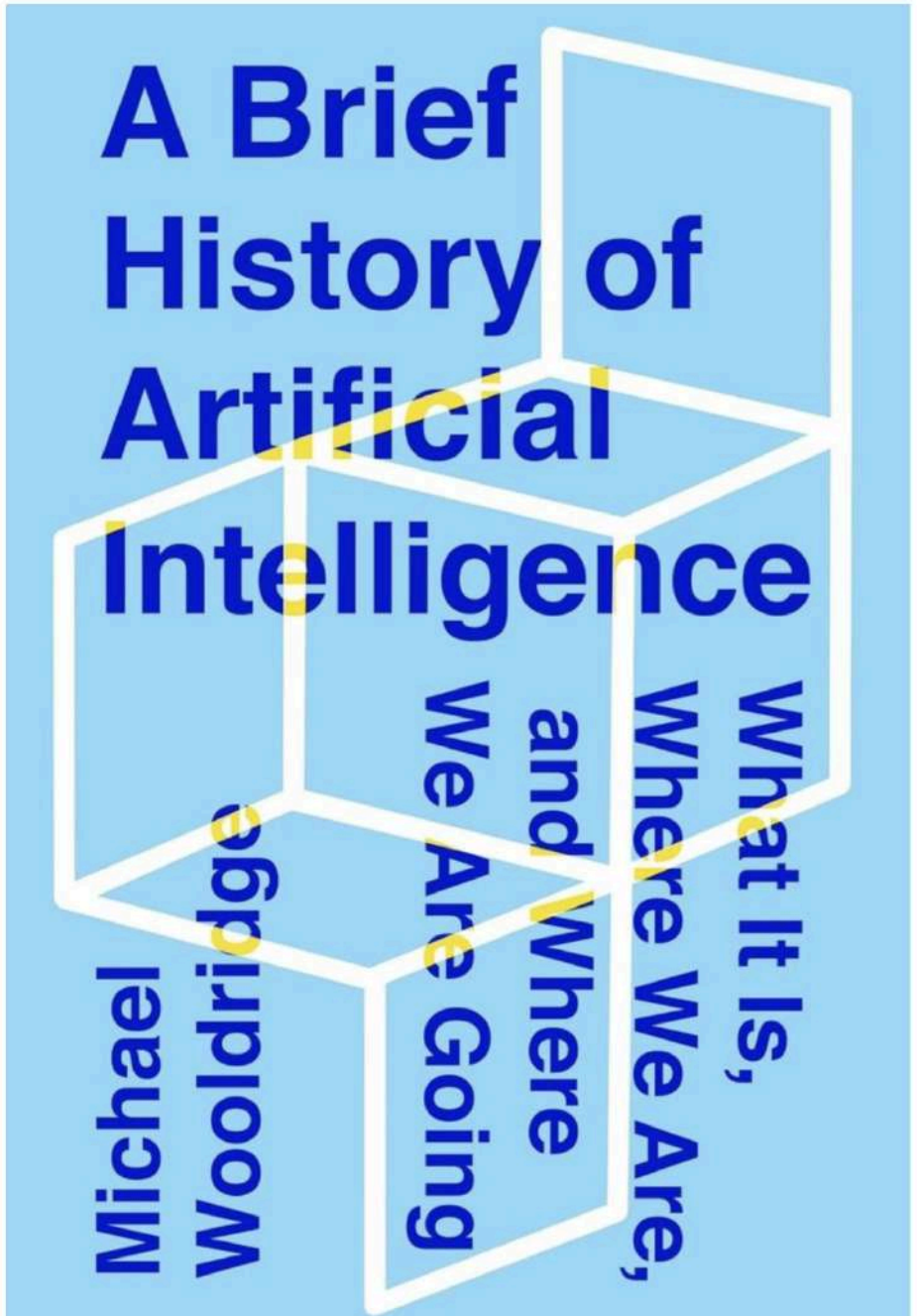
Generative AI is not search

- Responses are not being retrieved from a database; they are generated, one word at a time, using the prompt as a starting point
- There is therefore no 'ground truth' for LLMs, and no a priori model of the world that they refer to
- Data provenance is a difficult problem (see hallucinations and citation)
- Context windows = short-term memory (big context windows mean there's a lot you can talk about)
- AI can be a participant in the learning ecosystem rather than just an information source

Common misconceptions

- AI can't do X
- Healthcare is centred on relationships
- Only humans can take on the role of carer
- Practice has a morality component, and computers can't be moral
- Clinical reasoning is too complex for mere computers

Instead of defining what AI can't do, focus on how it changes **what we can do**



arithmetic (1945)	easy
sorting lists of numbers (1959)	easy
playing simple board games (1959)	solved, after a lot of effort
playing chess (1997)	solved, after a lot of effort
recognizing faces in pictures (2008)	solved, after a lot of effort
usable automated translation (2010)	solved, after a lot of effort
playing Go (2016)	solved, after a lot of effort
usable real-time translation of spoken words (2016)	solved, after a lot of effort
driverless cars	real progress
automatically providing captions for pictures	real progress
understanding a story & answering questions about it	nowhere near solved
human-level automated translation	nowhere near solved
interpreting what is going on in a photograph	nowhere near solved
writing interesting stories	nowhere near solved
interpreting a work of art	nowhere near solved
human-level general intelligence	nowhere near solved

Prompting

- 'Writing prompts' is not the same as 'keyword search'; it establishes the boundaries of the world used by the model to think.
- Contextual richness of the prompt is an important indicator of the quality of the generated response; more context = higher quality output.
- Role. Goal. Instruct. Discuss.
  - You are...; I am....; I want you to...
  - You are an experienced clinician. I am a novice. I need to understand...

Teaching students to communicate with AI is a new form of literacy

Naive and structured prompts

Naive prompt

> How do you manage a patient who is day 1 post-ACL repair?

Structured prompt

> I am a novice physiotherapist who is managing a 47-year-old male runner who is day 1 post-ACL repair. You are an experienced specialist clinician. I'm struggling with all aspects of managing this patient. Please help me develop a comprehensive plan. Start with the interview, then move on to the physical exam. Be detailed in your responses.

MR How do you manage a patient who is day 1 post-ACL repair?

Edit

Here's a concise overview of managing a patient on day 1 post-ACL repair:

1. Pain management:
   - Multimodal analgesia (e.g., opioids, NSAIDs, acetaminophen)
   - Ice therapy
2. Wound care:
   - Monitor dressing for bleeding or signs of infection
   - Keep incision site clean and dry
3. Mobilization:
   - Early weight-bearing as tolerated with crutches or walker
   - Teach proper gait with assistive devices
4. Range of motion:
   - Begin passive and active-assisted knee flexion exercises
   - Focus on achieving full knee extension
5. Exercises:
   - Quadriceps and hamstring isometrics
   - Ankle pumps for circulation
6. Swelling control:
   - Elevation of the limb
   - Compression (e.g., elastic bandage)
7. Patient education:
   - Explain post-operative precautions
   - Teach proper use of assistive devices
8. DVT prophylaxis:
   - Early mobilization
   - Mechanical or pharmacological interventions as prescribed
9. Follow-up:
   - Schedule next appointment with surgeon
   - Arrange outpatient physical therapy

Would you like me to elaborate on any specific aspect of day 1 post-ACL repair management?

ACL repair. You are an experienced specialist clinician. I'm struggling with all aspects of managing this patient. Please help me develop a comprehensive plan. Start with the interview, then move on to the physical exam. Be detailed in your responses.

Edit

I understand you're looking for guidance on managing a 47-year-old male runner who's one day post-ACL repair. As an experienced specialist, I'd be happy to walk you through a comprehensive plan, starting with the interview and moving on to the physical exam. Let's begin with the initial patient interview:

Interview:

1. Pain Assessment:
   - Ask about pain levels using a 0-10 Numeric Pain Rating Scale
   - Inquire about pain location, quality (sharp, dull, aching), and any radiating symptoms
   - Determine what aggravates or alleviates the pain
2. Current Functional Status:
   - Assess his ability to perform basic activities of daily living (ADLs)
   - Inquire about his current mobility status (e.g., using crutches, weight-bearing restrictions)
   - Ask about his sleep quality and any nighttime pain
3. Pre-surgery Status:
   - Gather information about the injury that led to surgery (mechanism, date, associated injuries)
   - Ask about pre-surgery symptoms and functional limitations
   - Inquire about any previous knee injuries or surgeries
4. Medical History:
   - Review any relevant medical conditions (e.g., diabetes, hypertension)
   - Ask about medications, especially those that might affect healing or exercise tolerance
   - Inquire about any allergies or sensitivities
5. Surgical Details:
   - Confirm the type of ACL graft used (autograft vs. allograft, specific tissue used)
   - Ask about any additional procedures performed during surgery (e.g., meniscus repair)
   - Review the surgeon's post-operative protocol and weight-bearing instructions
6. Patient Goals and Expectations:
   - Discuss the patient's short-term and long-term goals
   - Address any concerns or fears about the rehabilitation process
   - Inquire about his running history and future running aspirations
7. Social and Environmental Factors:
   - Assess his home environment (e.g., stairs, living arrangement)
   - Inquire about work status and potential return-to-work timeline
   - Discuss available social support during recovery

Physical Examination:

1. Observation:
   - Assess overall posture and gait pattern (if weight-bearing is allowed)
   - Observe the surgical site for signs of infection, excessive swelling, or bruising
   - Note any visible muscle atrophy, particularly in the quadriceps
2. Palpation:
   - Gently palpate around the knee joint, noting areas of tenderness or increased temperature
   - Assess the patella for mobility (within surgical protocol limits)
   - Palpate surrounding soft tissues for any abnormalities
3. Range of Motion (ROM):
   - Measure passive knee flexion and extension (within surgical protocol limits)
   - Assess active ROM as allowed by the protocol
   - Compare with the unaffected side
4. Strength Testing:
   - Perform isometric quadriceps and hamstring contractions
   - Assess hip and ankle strength if appropriate
   - Note any pain or apprehension during testing
5. Neurovascular Assessment:
   - Check distal pulses (dorsalis pedis and posterior tibial)
   - Assess sensation in the lower leg and foot
   - Test for signs of deep vein thrombosis (DVT)
6. Functional Tests (as allowed by protocol):
   - Assess ability to perform a straight leg raise
   - Evaluate standing balance (if weight-bearing is allowed)
   - Observe any compensatory movements during permitted activities
7. Swelling Assessment:
   - Measure knee circumference and compare to the unaffected side
   - Assess for joint effusion using the patellar tap test (if appropriate)
8. Incision and Wound Check:
   - Inspect the surgical incision for proper healing
   - Check for any signs of infection or wound complications
9. Pain Provocation Tests:
   - Perform gentle tests to identify pain-provoking movements or positions
   - Note any mechanical symptoms (e.g., clicking, catching)

Remember to continually communicate with the patient throughout the examination, explaining what you're doing and why. Be gentle and respect the surgical protocol and the patient's comfort levels.

Based on this comprehensive assessment, you'll be able to develop a tailored treatment plan that addresses the patient's immediate needs and sets the foundation for long-term recovery. Would you like me to elaborate on any specific aspects of the interview or

Tell me more about the ROM assessment. Why should I do this? What should I do if the ROM is beyond normal limits?

Purpose of ROM Assessment:

1. Baseline measurement: Establishes a starting point to track progress throughout rehabilitation.
2. Identify limitations: Helps detect any immediate post-surgical restrictions in movement.
3. Guide treatment: Informs your decision-making for exercises and interventions.
4. Monitor for complications: Can help identify issues like arthrofibrosis (excessive scar tissue formation) early.

If ROM is Beyond Normal Limits:

1. Hyperextension:
   - If the operated knee extends beyond 0 degrees (compared to the other side), this could indicate graft laxity.
   - Action: Document findings, avoid exercises that might stress the graft, and consult with the surgeon.
2. Excessive flexion:
   - More flexion than expected could risk damaging the graft.
   - Action: Adhere to the surgeon's protocol for ROM limitations. If uncertain, consult the surgeon before progressing flexion.
3. Severely limited ROM:
   - If ROM is significantly less than expected (e.g., unable to achieve 45 degrees flexion or 0 degrees extension): a. Check for excessive swelling or hemarthrosis (blood in the joint). b. Assess pain levels - severe pain might limit ROM. c. Consider early signs of arthrofibrosis.

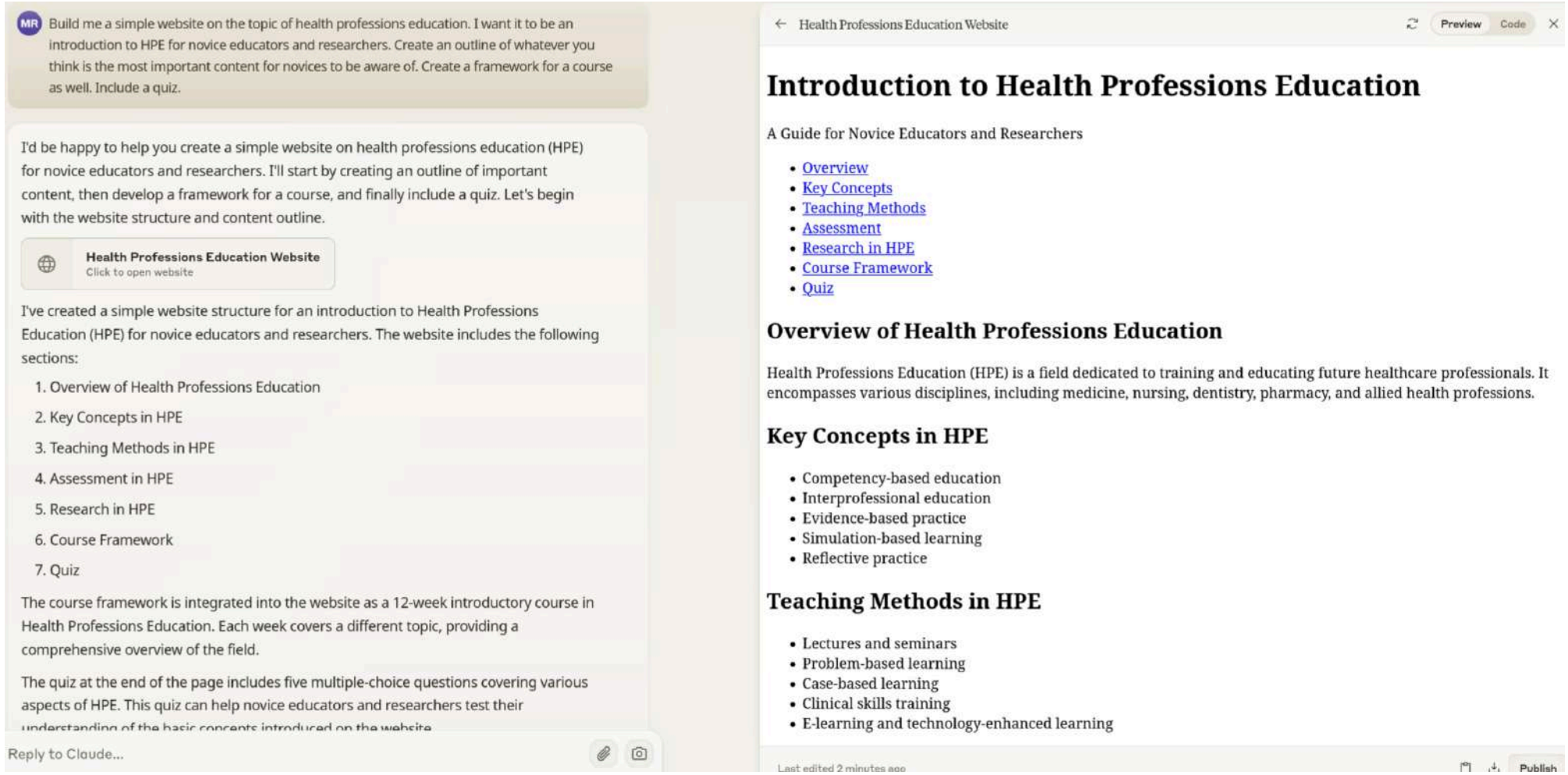
Activity: Speaking with AI

Use the following framework to create prompts that foster learning rather than just generate content:

- **Role**: You are...; I am...
- **Goal**: We are going to explore/understand/examine...
- **Instruct**: First, explain X. Then, help me understand the relationship to Y.
- **Discuss**: Let's critically examine these concepts together.

Work in pairs to design a prompt that helps develop understanding rather than just providing information

Building a course website



Activity: Redesigning learning experiences

Original approach: Build a 1-week course that takes me through important concepts

New approach: Teach students how to use AI to support their own learning

1. Identify a complex health concept students struggle with
2. Design a learning experience where students and AI collaborate to:
    - Map their current understanding and identify gaps
    - Create learning resources together
    - Reflect on how their understanding changes

Learning materials: Beyond efficiency

- Summarise slides → Help students create their own summaries
- Brainstorm learning activities → Support students in designing their learning paths
- Generate assessment tasks → Create authentic contexts for assessment
- Develop course outlines → Foster emergent curriculum design with student input

Key shift: From using AI to create better teaching materials to using AI to support student-centred learning processes

Image generation ("nursing school leader")

2022

2024

MR Analyse what is happening in this picture. Based on your analysis, what is the most likely test being conducted here?

This image shows two side-by-side photos of what appears to be a medical or physical therapy examination. In both photos, there's a shirtless man sitting on an examination table, and another man in a black shirt who seems to be a medical professional or therapist.

Multimedia theory in learning with AI

- People learn better from words and pictures than from words alone
- People learn better when corresponding words and pictures are presented closely
- People learn better from graphics and narrations than from animation and on-screen text
- People learn better when words are presented in a conversational rather than a formal style

Application: How can AI help create multimodal learning experiences that respect these principles while fostering student agency?

Multimodality in learning with AI

Instead of just asking AI to:

- Turn this description into a flowchart
- Read a simplified version
- Present information in a graph

Teach students to ask:

- Help me understand this concept in multiple ways
- Let's explore this idea through different representations
- How can we visualise this to make connections clearer?

Activity: Multimodal learning design

1. Choose a complex clinical concept that's difficult to understand through text alone
2. Design a multimodal learning experience that uses AI to help students engage with the concept through:
    - Visual representations
    - Simulated dialogue
    - Comparative analyses
    - Reflective prompts

Instead of using AI to simply describe an image, students could engage in dialogue with AI about the scenario

Feedback on student writing

- Personalised, timely feedback matters a lot
- ChatGPT (Dai, et al., n.d.):
  - Is capable of generating more detailed feedback that fluently and coherently summarises students' performance than human instructors;
  - Achieved high agreement with the instructor when assessing the topic of students' assignments;
  - Could provide feedback on the process of students completing the task, which benefits students developing learning skills

Paradigm shift: From AI providing feedback to AI participating in dialogue about evolving work

Activity: Learning-centred AI use

In groups, explore one of these uses of AI:

1. Create a lesson plan
2. Provide feedback on writing
3. Design a clinical case study

But with a twist: Focus on how to involve students in the process, making the creation part of the learning rather than just the consumption of the final product

AI detection case study

> We injected 100% AI written submissions into the examinations system in five undergraduate modules... 94% of our AI submissions were undetected. The grades awarded to our AI submissions were on average half a grade boundary higher than that achieved by real students.

Scarfe, et al. (2024)

Paradigm shift needed: From detecting AI use to assessing how well students collaborate with AI.

Beyond "AI-proof" assessment

> No, you don't have a cheating-proof or AI-proof assessment design. You just have a lack of imagination.
>
> To expand on this a little, I think it's not just wrong but dangerous to think that a task is AI-proof or cheating-proof. There's always going to be holes in any single assessment approach, and to think we have it solved can be thought-terminating.

Dawson (2024)

Question: How might assessment evolve when we embrace AI as part of the learning process?

AI and assessment: Changing the paradigm

- Assessment is prone to error because our inferences can only ever approximate what a student knows
- Assessment suffers from a threat to validity because of the errors inherent in the process
- **Old approach**: Use assessment design to solve the AI problem
- **New approach**: Use AI to solve the assessment design problem

New assessment paradigm

Traditional (SAP)	Learning-Centered with AI
Onerous to design and implement	Sustainable, adaptive assessment processes
Discrete snapshots rather than change over time	Continuous documentation of learning journey
Uniform and unaware of individual competence	Adaptive to individual learning needs and patterns
Inauthentic, adhering to the culture of schooling	Authentic tasks mirroring professional practice
Antiquated, assessing skills becoming obsolete	Modern, assessing collaboration with AI and uniquely human skills

Authentic assessment with AI

- Wrong question: "Where is the line differentiating between your knowledge and skills, and the AI?"
- Better question: "What real-world problem did you and the AI solve together?"
- Could your students:
  - Recognise a local health need and design an intervention?
  - Build a patient education resource with AI assistance?
  - Create clinical guidelines adapting evidence to local contexts?
  - Design and test a health promotion campaign?
  - Develop a quality improvement initiative for a clinical setting?
- Examples of students on an *AI Leadership* practice placement

Activity: Designing authentic assessments

1. Choose a learning outcome from your curriculum
2. Redesign an assessment to:
    - Focus on how students work with AI rather than what they produce
    - Emphasise process documentation over final product
    - Reflect authentic professional practice challenges
    - Require critical evaluation of AI contributions
    - Demonstrate metacognitive awareness

Hint: Ask AI to help with this redesign

AI policies beyond prohibition

Classroom-level policy example

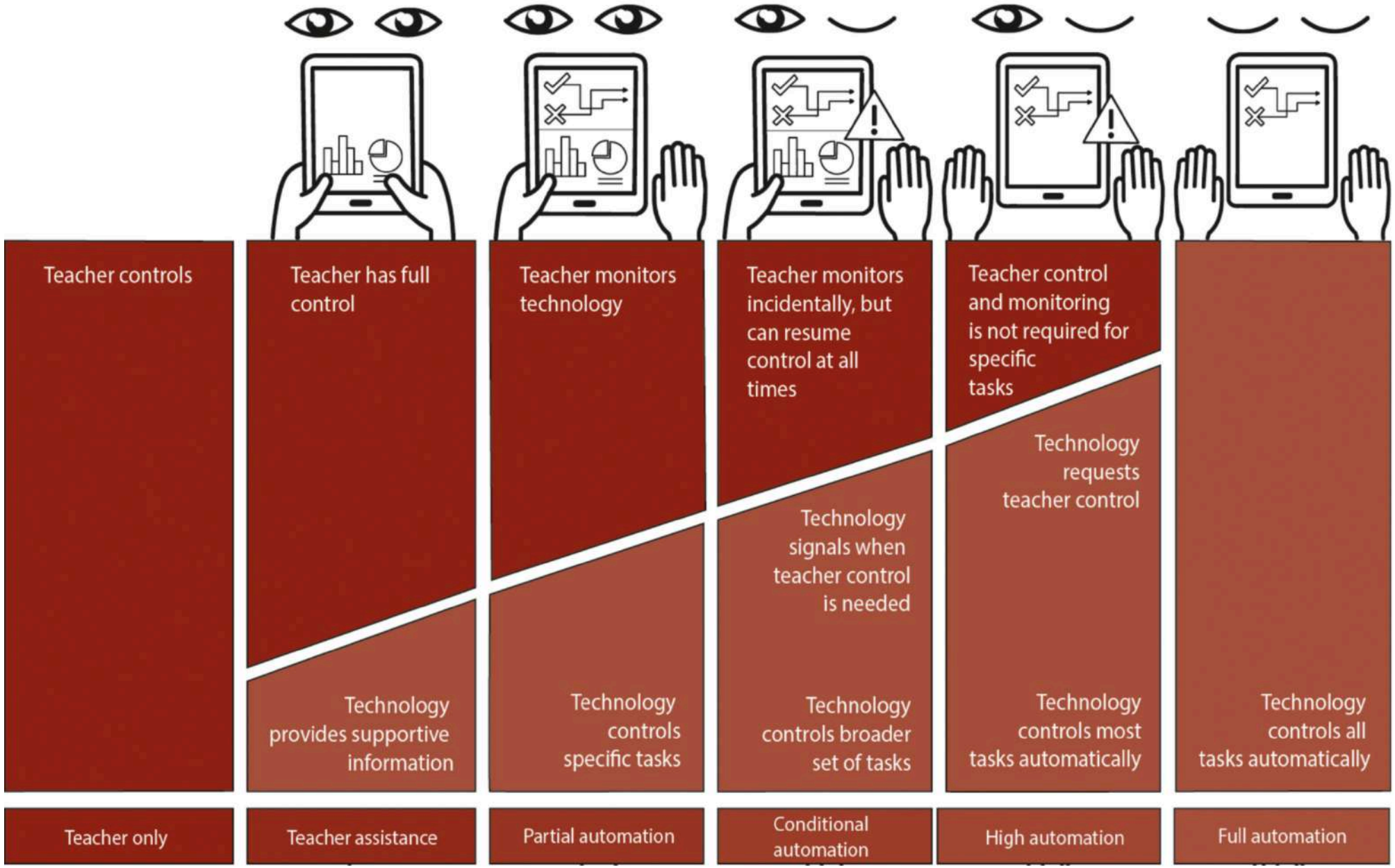
> In this module, I encourage you to use generative AI to support your learning. Learning to use AI tools is an emerging professional skill.
>
> You may use AI to ask the same types of questions you would typically ask a lecturer or peer.
>
> For each assignment where you use AI, document your learning process: (a) the prompts you used, (b) how you evaluated the output, (c) what you learned about effectively working with AI.

Activity: Developing a learning-centred AI policy

Instead of a policy that focuses primarily on academic integrity concerns, craft a policy that:

1. Recognises AI as a learning partner
2. Establishes expectations for documenting AI collaboration
3. Encourages metacognitive reflection on the process
4. Frames AI literacy as a professional competency
5. Specifies how AI use aligns with learning outcomes

Work in pairs to draft a sample policy for a course you teach


Teacher controls
Teacher has full control
Technology provides supportive information
Teacher monitors technology
Technology controls specific tasks
Teacher monitors incidentally, but can resume control at all times
Technology signals when teacher control is needed
Technology controls broader set of tasks
Teacher control and monitoring is not required for specific tasks
Technology requests teacher control
Technology controls most tasks automatically
Technology controls all tasks automatically
Teacher only
Teacher assistance
Partial automation
Conditional automation
High automation
Full automation

AI-supported learning environments

Effective AI-supported learning should:

1. Foster dialogue and co-construction rather than content delivery
2. Develop critical consciousness about both content and technology
3. Build adaptive expertise for complex, unpredictable situations
4. Embed learning in authentic contexts
5. Allow for emergent, responsive curriculum paths
6. Enhance metacognitive awareness
7. Support knowledge building across professional boundaries

AI tutors as learning partners

- AI tutors are getting very good.
  - Many students value AI for its availability, patience, and lack of perceived judgement (Webb, 2024)
- "LearnLM-Tutor is consistently preferred over a prompt tuned Gemini by educators and learners on a number of pedagogical dimensions" (Jurenka, et al., 2024)
- OpenAI have released a fine-tuned version of GPT that supports learning, called ChatGPT Edu (OpenAI, 2024)

Beyond content generation: How might these systems become true learning partners rather than just information providers?

Activity: Dialogic learning with AI

Upload a clinical scenario, research paper, or case study and:

1. Use the **Role, Goal, Instruct, Discuss** framework to engage in a learning dialogue with AI
2. Ask the AI to present multiple perspectives or approaches
3. Have the AI debate itself based on different theoretical frameworks
4. Document how this dialogue changes your understanding compared to simply reading similar content

AI+Human collaboration

- In 'centaur chess', human-AI teams outperform both human grandmasters and solo AIs
- The future of clinical practice may be a similar human-AI collaboration rather than human vs AI
- Clinicians who learn to effectively leverage AI will have a major advantage
- This requires a shift in mindset and developing new skills to manage the human-AI interface

Key insight: The same is true for education—human teachers collaborating with AI can create learning experiences neither could design alone

Treat generative AI like a learning partner

- Generative AI as expertise within, and across, professional domains
  - Extensive knowledge, and the ability to apply it in creative ways
  - The ability to understand and navigate complexity
- It has expert communication skills, working with natural language
- Evaluate its responses on a spectrum that assumes some level of error and adjust expectations accordingly
- 'Collaboration' means shared responsibility for learning outcomes

Action planning

- Personal action plan: Identify 3 concrete ways to use AI not just to make your current teaching more efficient, but to transform your approach to supporting learning.
- Consider:
  - How might AI help students take more ownership of their learning?
  - How could AI support more authentic, complex learning experiences?
  - What assessment approaches might better align with an AI-enabled world?

Summary

- Generative AI is constantly increasing in capabilities, including multimodality
- Generative AI can be used to support teaching, assessment, and learning activities
- Avoid positioning ourselves in opposition to AI / Students+AI; focus on learning with students+AI
- AI in support of teaching, learning, and assessment is the only rational way forward
- Assessment reform is OK, education reform is better

Thank you

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