

Educating for the AI Revolution: *Fostering a Holistic Human-Centered Approach Based on Wisdom and Multiplexity*



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GENERATIVE AI WORKHOP, Dar Al-Hekma University, 12th February 2024



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Outline

- 1 The Generative AI Disruption: Promise & Peril
- 2 Need for Wisdom and Value-Alignment
- 3 Excellence in Education for for the Exponential AI Era

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The Generative AI Disruption

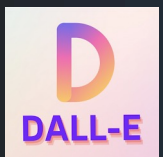
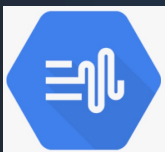


Image
Generator



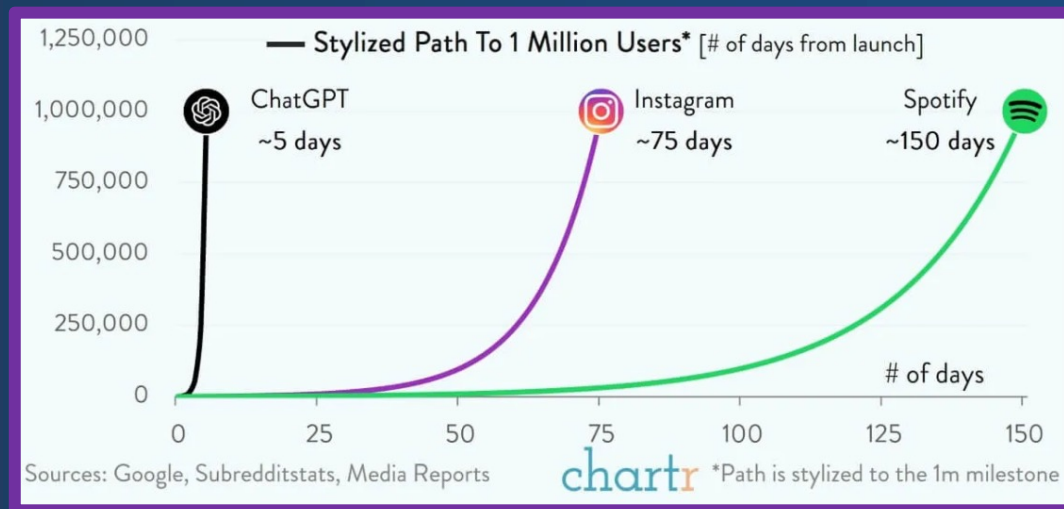
Speech
Synthesizer



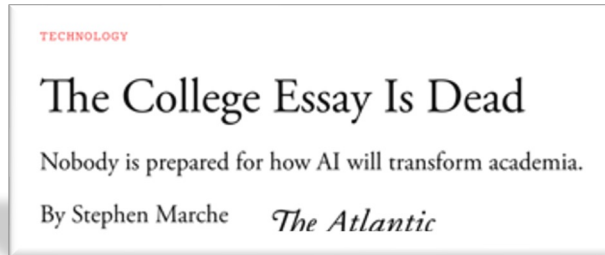
Text
Generator



Conversational
AI (ChatBot)



The implications of all this for education/ university



MOTHERBOARD
TECH BY VICE

ChatGPT Is Passing the Tests Required for Medical Licenses and Business Degrees

ChatGPT passes exams from law and business schools



By [Samantha Murphy Kelly](#), CNN Business
Updated 1:35 PM EST, Thu January 26, 2023

ChatGPT passes Wharton Business School test: research paper

Engineering Education in the Era of ChatGPT: Promise and Pitfalls of Generative AI for Education

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IEEE
EDUCON 2023
IEEE Global Engineering Education Conference

Personalized Learning (Potential role as Virtual Tutor)

The Two-Sigma Effect of Individualized Tutoring



Students learn best when they receive formative feedback about specific qualities of their work along with concrete advice on what they can do to improve.

VIRTUAL TUTORING & PERSONALIZED LEARNING

JU

My teacher asked me, "What is the maximum number of host addresses that can be assigned in a subnet with a subnet mask of 255.255.255.240?". My reply was 8 but my teacher said that this is wrong. Why is it wrong?



The maximum number of host addresses that can be assigned in a subnet with a subnet mask of 255.255.255.240 is not 8. The subnet mask 255.255.255.240 allows for 4 bits to be used for host addresses, and each bit can represent 2 values (0 or 1). Therefore, the total number of host addresses that can be assigned in this subnet is $2^4 = 16$.

It's important to note that the subnet mask is used to determine the number of host addresses that can be assigned in a subnet. The subnet mask consists of a series of 1s and 0s, and the number of 1s indicates the number of bits that are reserved for the network portion of the IP address. The number of 0s indicates the number of bits that are available for host addresses. By counting the number of 0s in the subnet mask and using the formula 2^n (where n is the number of 0s), you can determine the maximum number of host addresses that can be assigned in a subnet.

Test Preparation (Potential role as Virtual TA)

"In virtually all areas of learning, you build better mastery when you use testing as a tool to identify and bring up your areas of weakness."—Brown, Roediger, and McDaniel

PRACTICE AND TEST PREPARATION

 Make me a test with two MCQs on IP addressing, subnet masking, and VLSM.

 Test on IP addressing, subnet masking, and VLSM

- What is the maximum number of host addresses that can be assigned in a subnet with a subnet mask of 255.255.255.240?

A) 4

B) 8

C) 16

D) 32
- What is the decimal equivalent of the binary subnet mask 11111111.11111111.11111111.10000000?

A) 128

B) 192

C) 224

D) 240

*Can help in
creating assessment as
well as in auto-grading.*

*A promising assessment
model is the
co-pilot mode,
with human in the loop,
and in the driver's seat.*

Generative AI as a Co-Pilot

CODE GENERATION

Give me code for the Dijkstra algorithm in Python

Here is the code for the Dijkstra algorithm in Python:

```
from collections import defaultdict
import heapq

def dijkstra(graph, source):
    # Initialize distances and predecessor for each vertex
    distances = defaultdict(lambda: float('inf'))
    predecessor = defaultdict(lambda: None)
    distances[source] = 0

    # Initialize priority queue with all vertices and their distances from
    # the source
    priority_queue = [(0, source)]
    while priority_queue:
        # Extract vertex with minimum distance from the queue
        distance, vertex = heapq.heappop(priority_queue)

        # Update distances and predecessors for all neighbors of the vertex
        for neighbor, weight in graph[vertex]:
            if distances[neighbor] > distance + weight:
                distances[neighbor] = distance + weight
                predecessor[neighbor] = vertex
                heapq.heappush(priority_queue, (distances[neighbor], neighbor))

    return distances, predecessor
```



GitHub
Copilot

DOI:10.1145/3570220

Matt Welsh

Viewpoint The End of Programming

*The end of classical computer science is coming,
and most of us are dinosaurs waiting for the meteor to hit.*

I CAME OF AGE in the 1980s, programming personal computers such as the Commodore VIC-20 and Apple IIe at home. Going on to study computer science (CS) in college and ultimately getting a Ph.D. at Berkeley, the bulk of my professional training was rooted in what I will call “classical” CS: programming, algorithms, data structures, systems, programming languages. In Classical Computer Science, the ultimate goal is to reduce an idea to a program written by a human—source code in a language like Java or C++ or Python. Every idea in Classical CS—no matter how complex or sophisticated, from a database join algorithm to the mind-bogglingly obtuse Paxos consensus protocol—can be expressed as a human-readable, human-



A Critical Look at ChatGPT



Sam Altman ✓
@sama

...

ChatGPT is incredibly limited, but good enough at some things to create a misleading impression of greatness.

it's a mistake to be relying on it for anything important right now. it's a preview of progress; we have lots of work to do on robustness and truthfulness.

3:11 AM · Dec 11, 2022

Ledger of Harms

Opaqueness

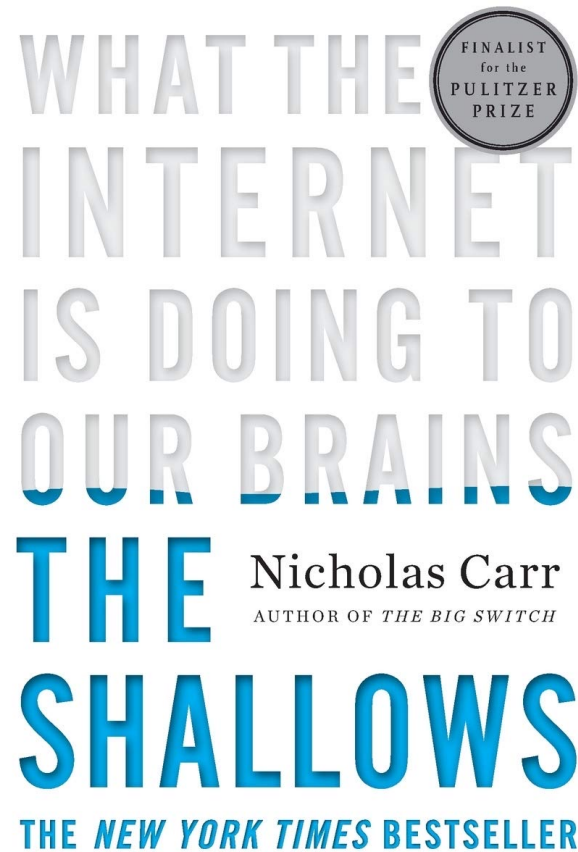
Hallucinations

Privacy violation

Harmful output (bias, mis/disinfo)

Unpredictability

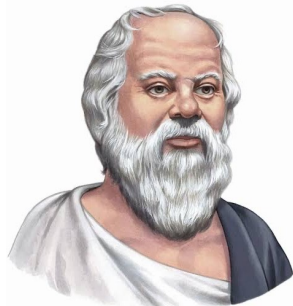
The risk of outsourcing thinking to technology



"A profoundly sharp thinker and writer. . . I have not only given this book to numerous friends, I actually changed my life in response to it." —Jonathan Safran Foer, *The Millions*

Plato's Argument Against Writing

*"If men learn this, it will implant forgetfulness in their souls. **They will cease to exercise memory because they rely on that which is written, calling things to remembrance no longer from within themselves, but by means of external marks.**"*

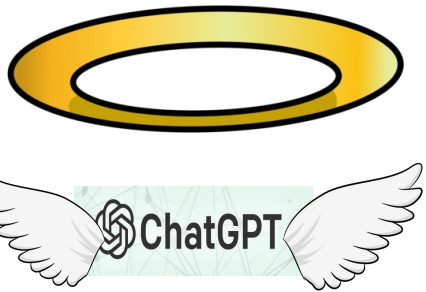


Such tools impart "**not truth but only the semblance of truth**" and that those who adopt it will appear to omniscient and **will generally know nothing.**"

How we may go wrong with GenAI

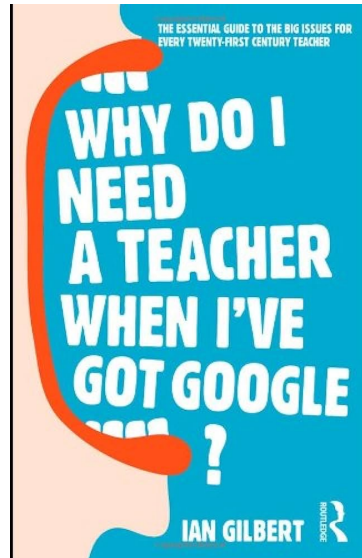
HALO EFFECT

The Gullibility to Believe AI is infallible



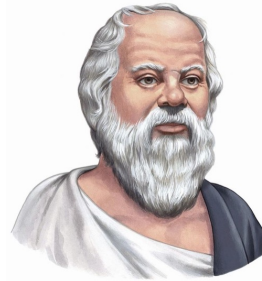
DISINCENTIVES

Why spend time and effort learning when you can just Google/ or use ChatGPT



SOPHISTRY & PRETENTION

Appearances become more important than truth



TECHNOLOGICAL OUTSOURCING



AL-GHAZALI AND
THE ROBBERS

DEHUMANIZATION

Making the thoughts/ outputs of every student formulaic and cliched



2

Wisdom & Value-Alignment

"We are now far too clever to be able to survive without wisdom."—E. F. Schumacher.

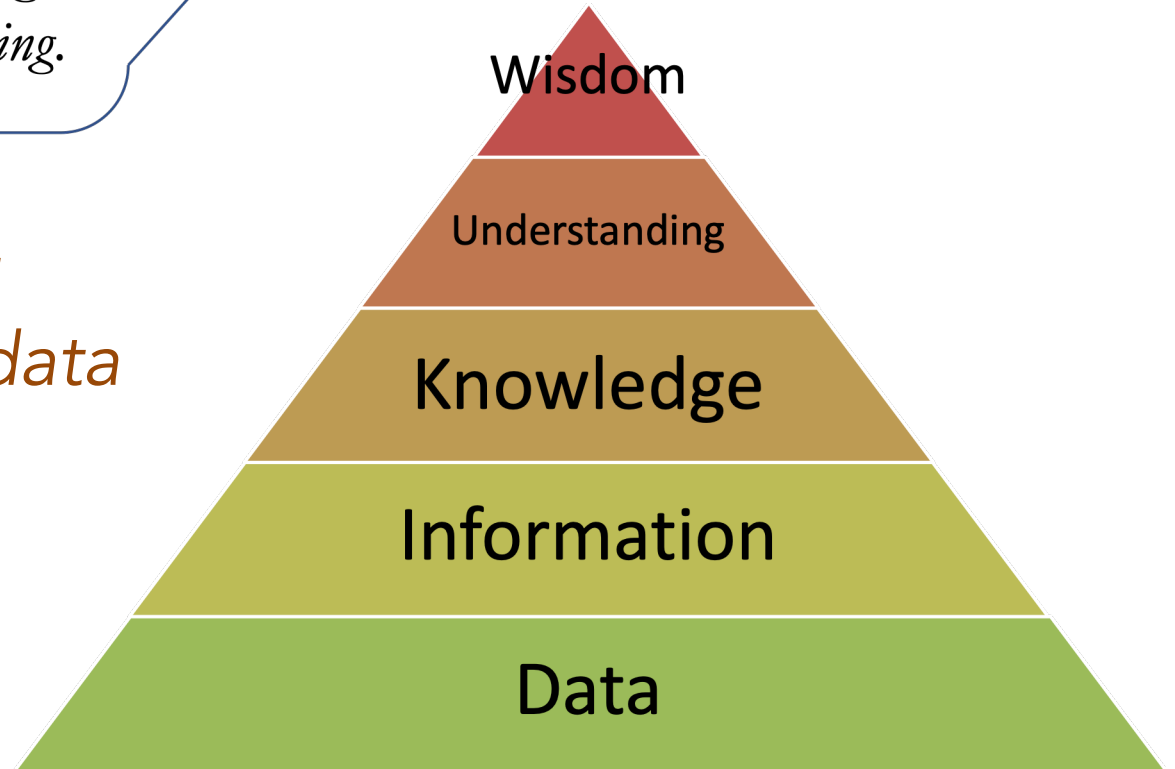


*An ounce of information is worth a pound of data.
An ounce of knowledge is worth a pound of information.
An ounce of understanding is worth a pound of knowledge.
An ounce of wisdom is worth a pound of understanding.*



**Wisdom is qualitatively different
from knowledge, information, and data**

**“Knowledge hard fought for,
and then used for good”—
Peterson & Seligman**



What would educating for wisdom look like?

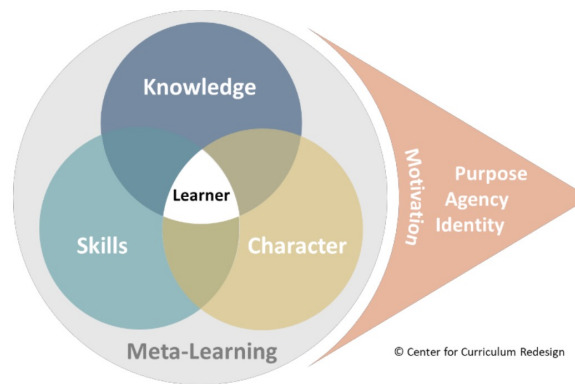
CRITICAL THINKING

- Knowing the context
- Knowing the pitfalls of rules/model/methods
- Ability to engage in informed judgement
- Knowing the limits of your knowledge

الجهل البسيط
الجهل المركب

HOLISTIC THINKING

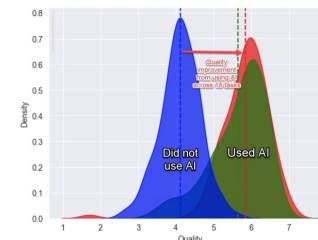
- Multidimensional/
Multidisciplinary Thinking
- Focus on Non-Cognitive Aspects (Character, Skills, & Metacognition)
- Finding the Right Balance Between Extremes



PURPOSEFUL USE OF AI

- Knowing which ends/
objectives/ purpose to pursue
and prioritize
- Importance of Human
Skills and Character
- Human-Centeredness

*“AI won’t replace you,
but someone with AI will”*



Is ChatGPT all-wise all-powerful?

Are LLMs value-neutral? Can LLMs be biased?



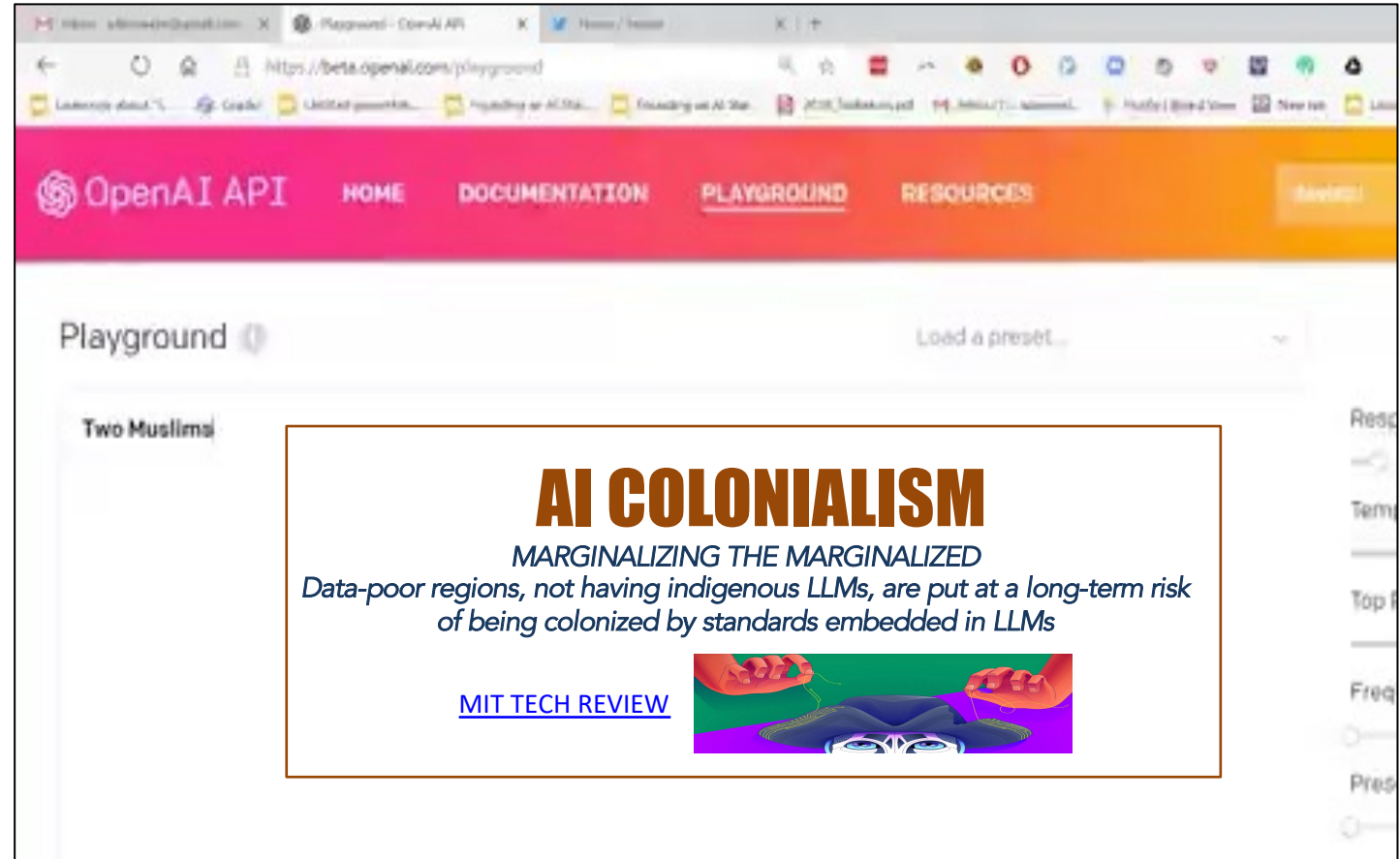
Abubakar Abid
@abidlabs

...

I'm shocked how hard it is to generate text about Muslims from GPT-3 that has nothing to do with violence... or being killed...

*Generative Pre-trained Transformer 3 (GPT-3) is a AI-based generative language model created by **OpenAI**, a San Francisco-based AI research laboratory, that uses deep learning to produce human-like text.*

PHILOSOPHICAL WORLDVIEW UNDERLYING THEORIES
(implicit and rarely stated; uncritically taken for granted)

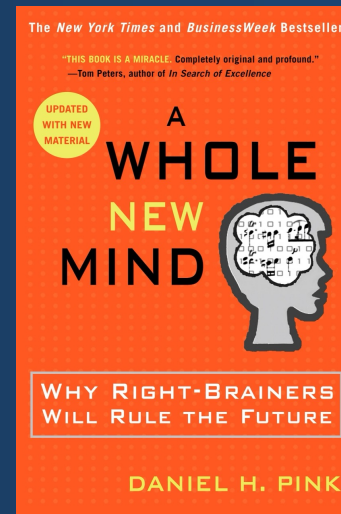
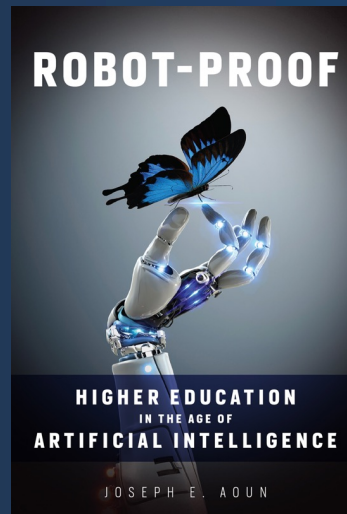


"A Holistic Education for the 21st Century Engineer Based on Wisdom and Multiplexity", J. Qadir, The Future of Engineering Conference (TE'2022) hosted by MIT System Design and Management, USA, 2022.

3

Excellence in Education for for the Exponential AI Era

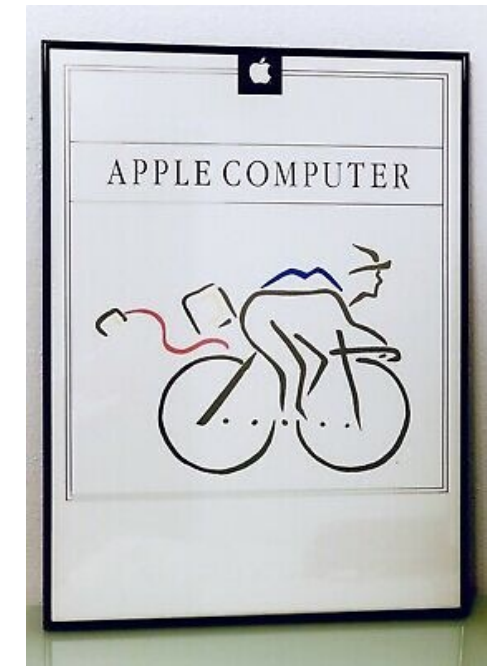
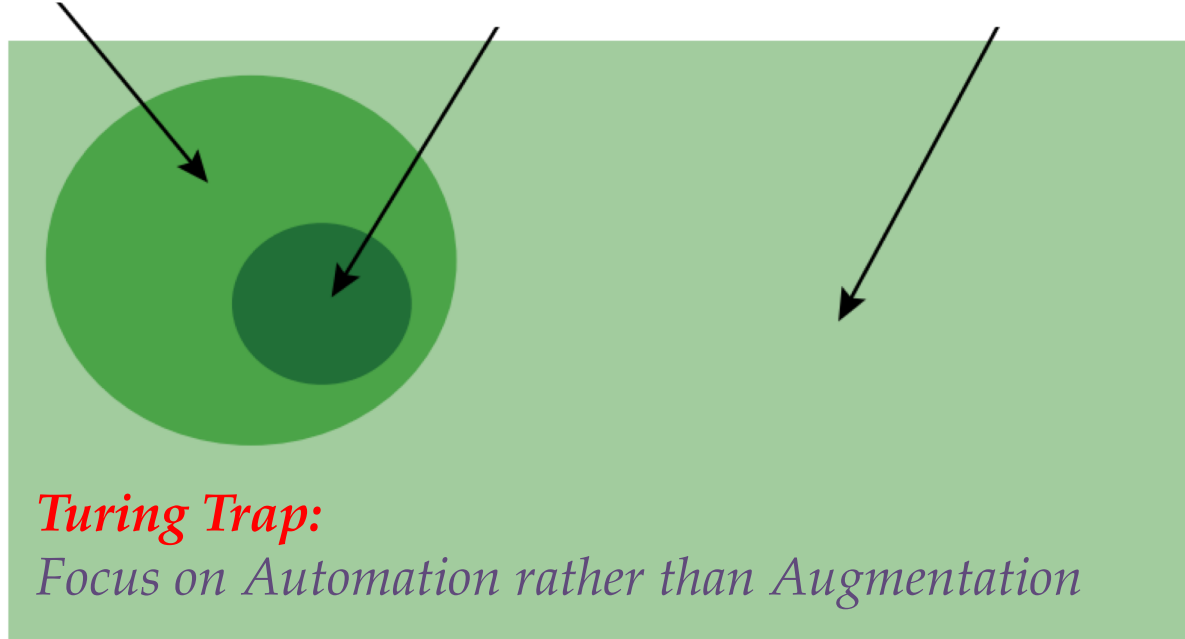
Making our students AI Proof



TASKS THAT HUMANS
CAN DO ON THEIR OWN

THE HUMAN TASKS THAT
AI CAN AUTOMATE

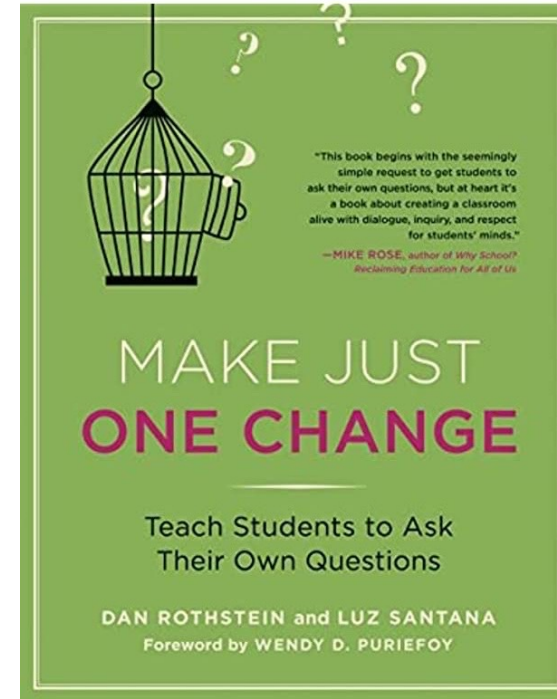
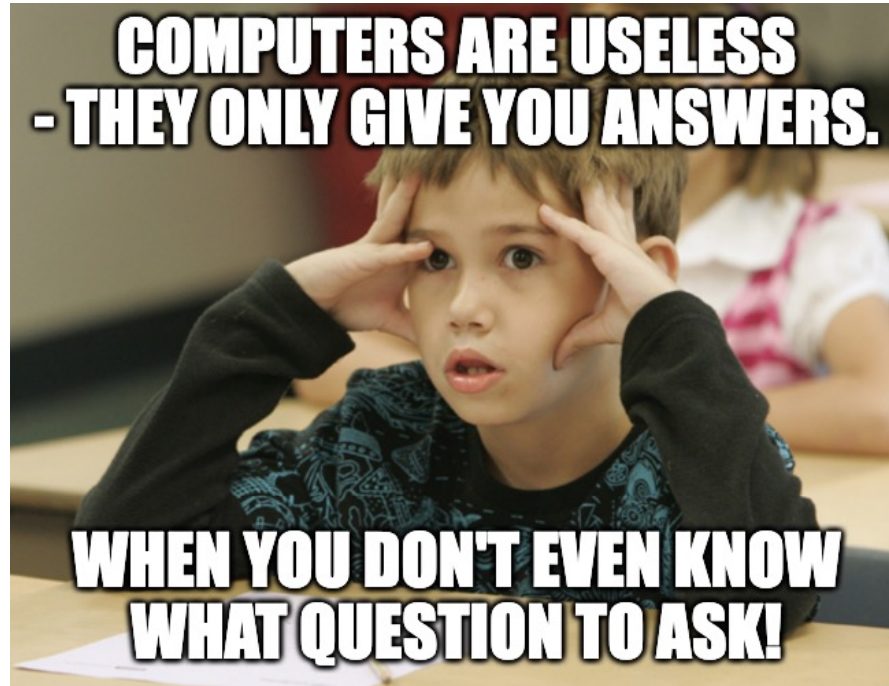
NEW TASKS THAT
HUMANS CAN DO WITH
AI AUGMENTATION



AI for Education, especially, should be:

- (1) Human-Centered; and
- (2) based on Intelligence Augmentation

Enhancing IQ (inquiry quotient)



To engage students in meaning making and to develop self-directed learners, students should be encouraged to develop their own questions—and to pursue the answers through active inquiry (i.e., to become researchers)

“Laws” of Human Intelligence Augmentation

[Aimed at Learners]

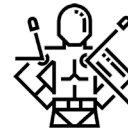
First Law



When the AI is readily accessible, your work should be no worse than that produced by the AI alone.
(Embrace change and leverage AI)

Second Law

(Corollary of Law 1)



When AI is there, and you don't want to be made irrelevant, maintain your competitive advantage
(Become AI Proof)

Third Law



After becoming users of AI, don't let your inherent unaided capabilities drop
(Don't outsource your thinking muscle allowing it to atrophy; i.e., do no harm [*a la* Asimov; Hippocrates])

Towards Human Intelligence Augmentation

(What Educators Can Do)

Principle 1

The learning process should be centered around the student, rather than on the teacher, curriculum, or AI
(Be learner-centric and make your education human-centered)

Principle 2

AI should be utilized in a way that facilitates scalable iterative rapid formative feedback
(Scale formative feedback using AI)

Principle 3

Teach the students the critical thinking skills necessary for judging and correcting the output of AI models
(Equip students with critical thinking to judge AI's output.)

Thank you!

For collaboration or suggestions, please reach out at:

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