




NAVIGATING THE FUTURE OF LANGUAGE EDUCATION:
FROM GENERATIVE AI TO CYBER-PHYSICAL LEARNING





The background of the image is a dark, futuristic cityscape at night. Tall buildings are visible, some with glowing windows. In the foreground, a person is seen from behind, standing in a digital corridor. The corridor is composed of glowing lines and shapes, creating a sense of depth and movement. The overall atmosphere is one of advanced technology and urban development.

AI advancements could have profound implications on China's labour market, said Yi Gang, former governor of the People's Bank of China and a professor at Peking University.

“As AI sets to replace human workers, the structural mismatch between labour supply and demand could persist in the future,” he said in an article earlier this month.

TECH • FORTUNE GLOBAL FORUM

World's first AI minister likenes risk of overregulation to calligraphers that kept the printing press out of the Middle East for nearly 200 years

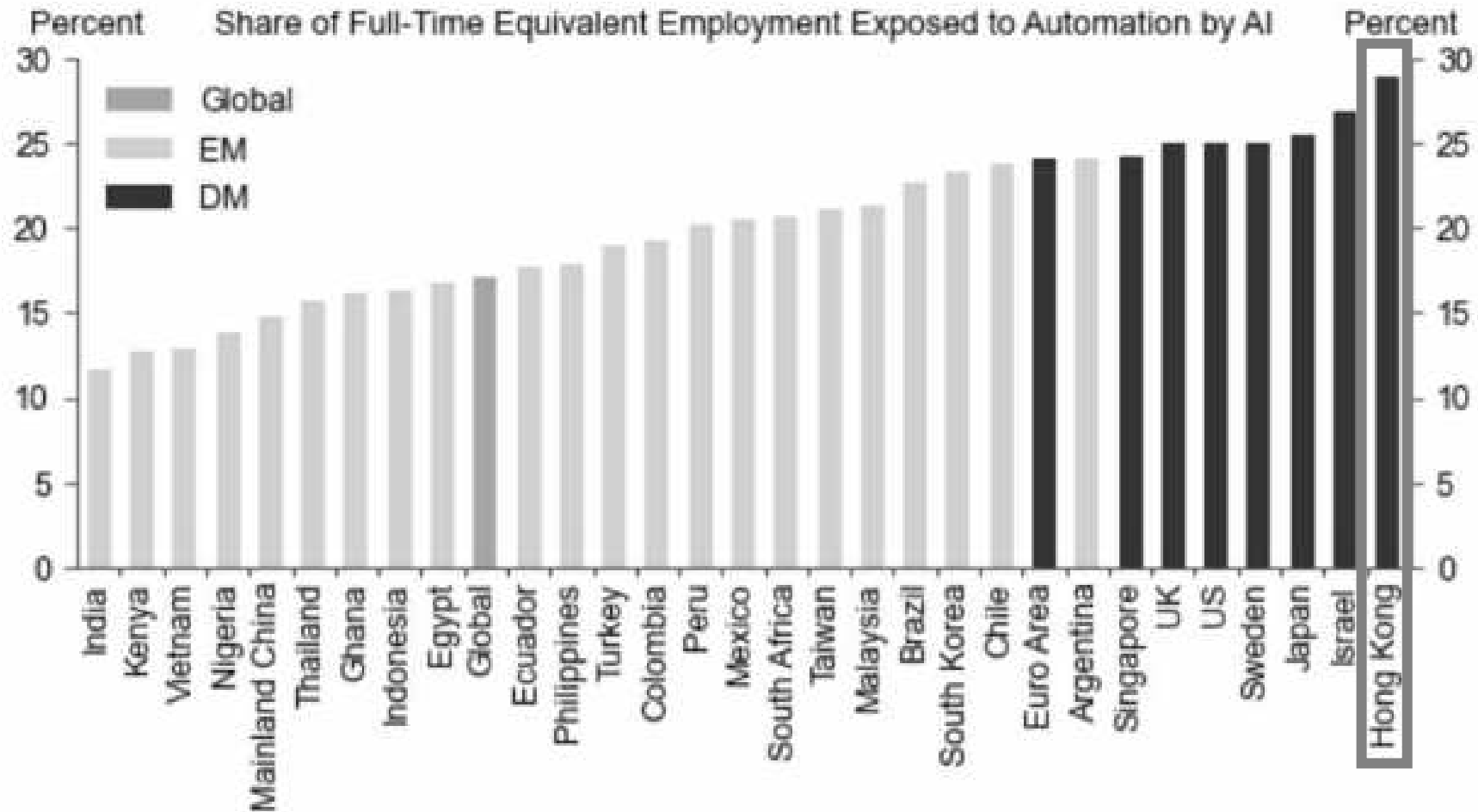
In his 1515 rejection of the printing press, an Ottoman sultan brought the golden age of Islamic math and science to an abrupt end.

BY CHRISTIAAN HETZNER

November 28, 2023 12:50 PM EST



Exhibit 6: Globally, 18% of Work Could be Automated by AI, with Larger Effects in DMs than EMs



The Potentially Large Effects of Artificial Intelligence on Economic Growth (Briggs/Kodnani). 26 March, 2023

[https://www.key4biz.it/wp-content/uploads/2023/03/Global-Economics-Analyst -The-Potentially-Large-Effects-of-Artificial-Intelligence-on-Economic-Growth-Briggs_Kodnani.pdf](https://www.key4biz.it/wp-content/uploads/2023/03/Global-Economics-Analyst-The-Potentially-Large-Effects-of-Artificial-Intelligence-on-Economic-Growth-Briggs_Kodnani.pdf)

3.71 With the wide-spread application of IT at the workplace, the on-going development on technology measures including artificial intelligence, data analytics and robotics technologies and their potential adoption in various business processes, the total requirements for IT workers are projected to be on an upward trend at an average annual rate of 2.5% during the projection period to 119 000 in 2027. The manpower requirements of IT workers of the economy as a whole by IT-related occupation group in 2016 and 2027 are set out in **Table 3.27**.

Table 3.27 Manpower Requirements of IT Workers by IT-related Occupation Group in 2016^a and 2027

IT-related occupation group	Actual manpower requirements in 2016 ^a		Projected manpower requirements in 2027		Projected change from 2016 to 2027	Projected average annual rate of change (2016 – 2027)
	Number	% share	Number	% share		
IT managers	7 000	7.8	9 200	7.8	+ 2 200	+ 2.5%
IT professionals	47 400	52.4	64 900	54.5	+ 17 500	+ 2.9%
IT associate professionals	30 200	33.4	36 100	30.3	+ 5 800	+ 1.6%
IT sales workers	5 800	6.4	8 800	7.4	+ 3 000	+ 3.8%
IT personnel	90 400	100.0	119 000	100.0	+ 28 500	+ 2.5%

& The actual manpower requirements of IT workers were compiled based on findings of the “2016 Manpower Survey on Information Technology Sector” conducted by the VTC, which were the latest available information at the time the projection was being compiled.

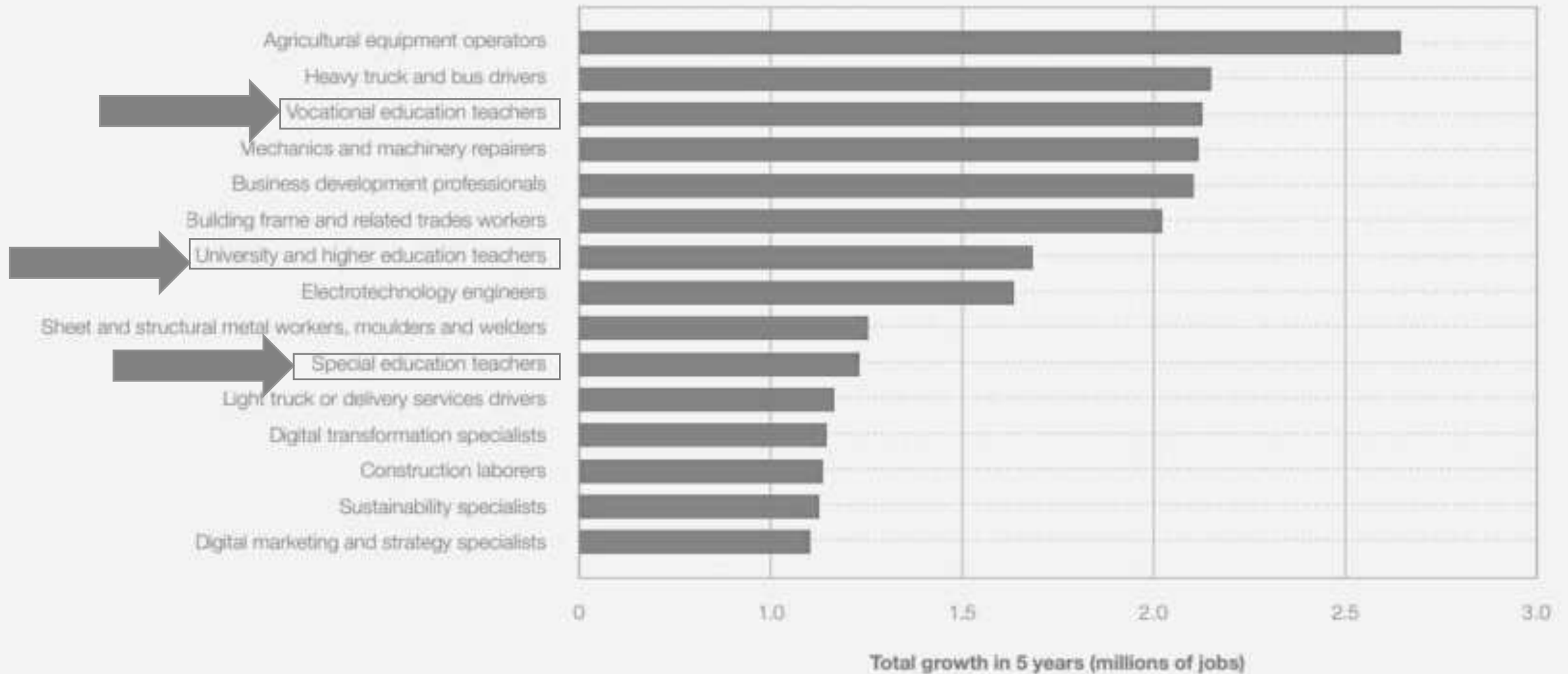
Note: Individual figures may not add up to the totals due to rounding.

- (e) *First degree* – the demand for workers with qualifications of *first degree* is projected to grow considerably along with Hong Kong’s transformation to a knowledge-based and high value-added economy advocating innovation, professionalism and adoption of technology and **artificial intelligence**. It is anticipated that there will be **a manpower shortfall of 50 900** for this labour segment in 2027; and

FIGURE 3.4

Largest job growth, millions

Top roles ordered by largest net job growth, calculated based on ILO Occupation Employment statistics and growth reported by organizations surveyed



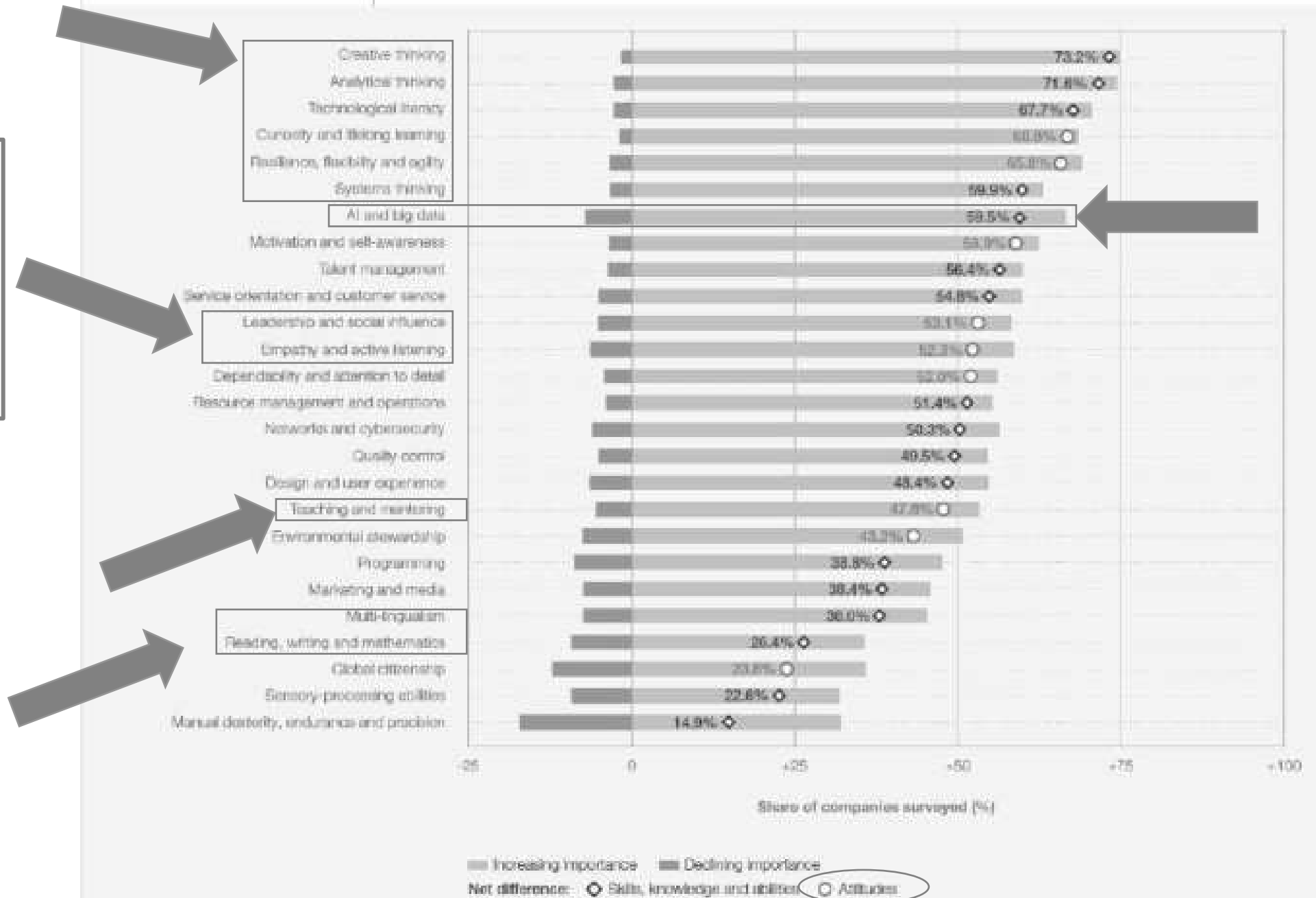
Source

World Economic Forum, Future of Jobs Survey 2023.

FIGURE 4.3 Skills on the rise

Share of organizations surveyed which consider skills to be increasing or decreasing in importance, ordered by the net difference.

Importance of communication / language skills (implicitly or explicitly)







What is language education at the HE level?
Should it be value-based, competency-based, proficiency-based, or a harmonious combination of these?



Future of work

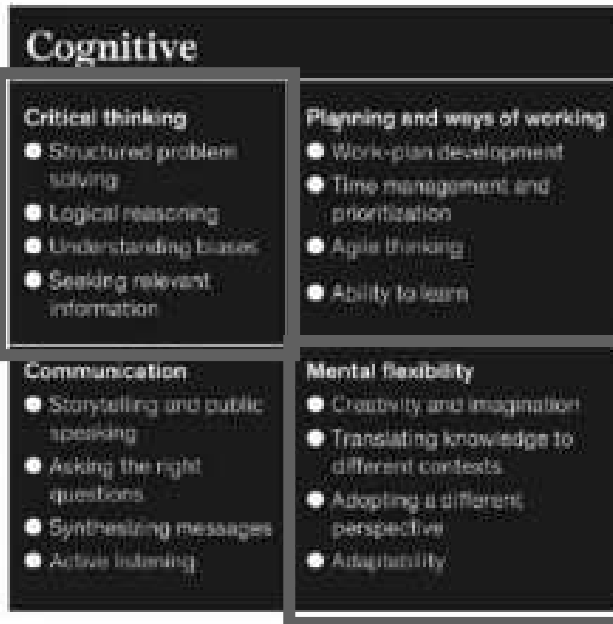
Technological skills: such as digital literacy, coding, data analysis, artificial intelligence, etc.

Social skills: such as communication, collaboration, empathy, intercultural understanding, etc.

Higher cognitive skills: such as critical thinking, creativity, problem-solving, learning to learn, etc.

- <http://oecd.org>
- <http://weforum.org>
- <http://unesco.org>

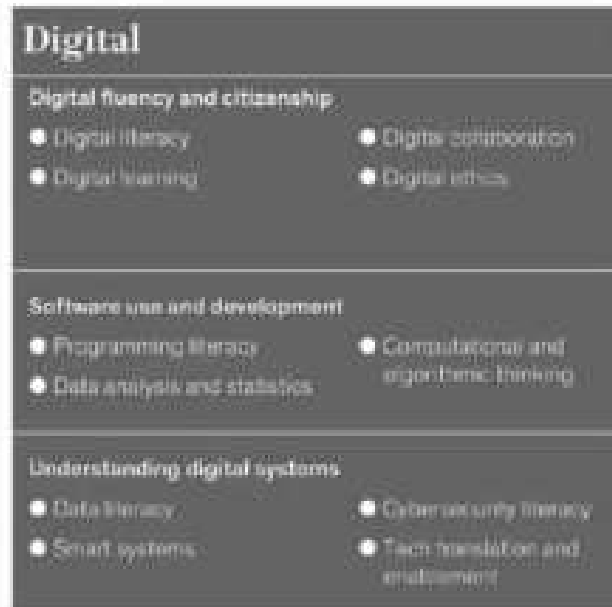
56 DELTAS¹ across 13 skill groups and four categories

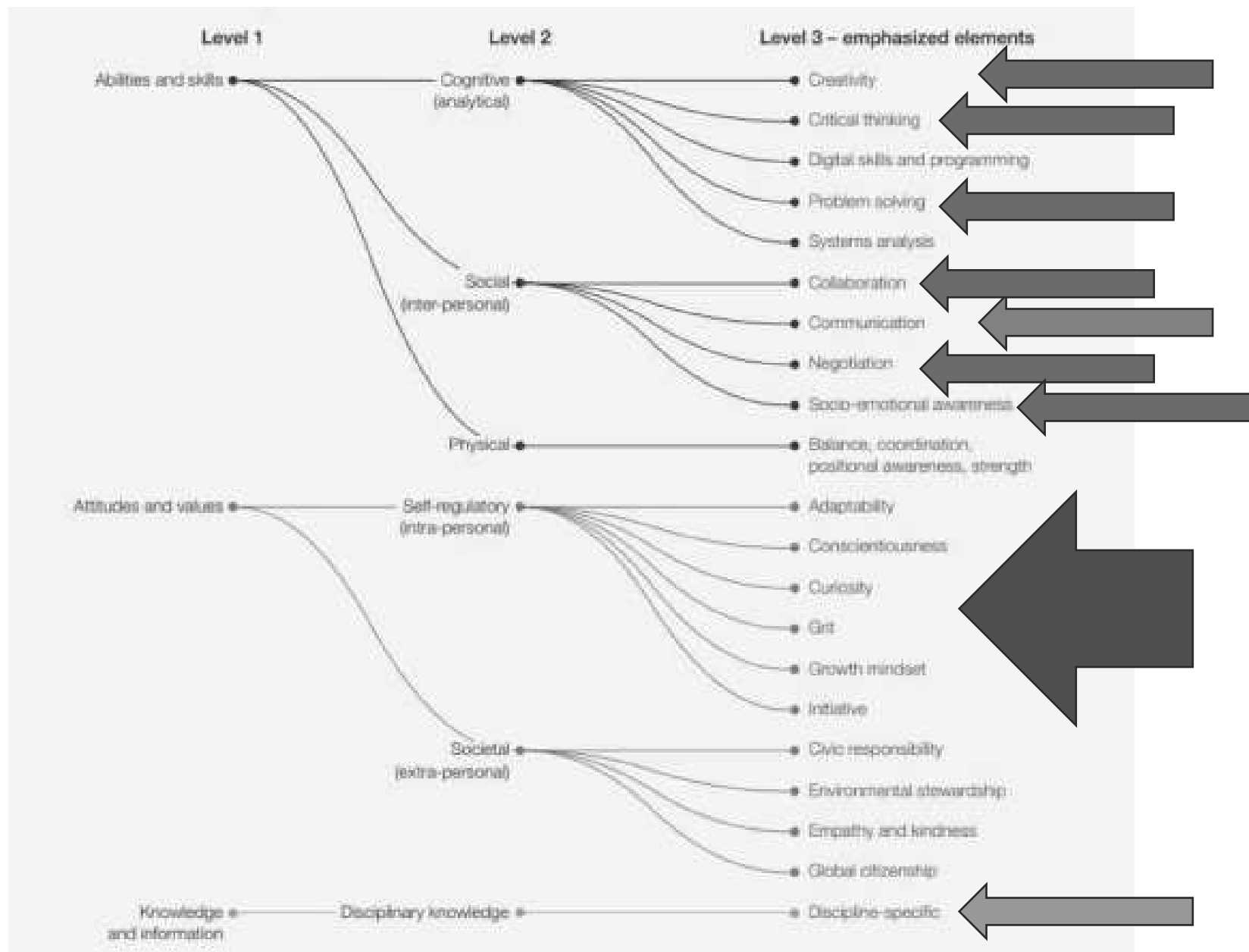


DISTINCT ELEMENTS OF TALENT (DELTA)

McKinsey Global Institute

[McKinsey: Which skills will be needed for the future of work? | World Economic Forum \(weforum.org\)](#)





Defining Education 4.0: A Taxonomy for the Future of Learning: White Paper (January, 2023)

[https://www3.weforum.org/docs/WEF Defining Education 4.0 2023.pdf](https://www3.weforum.org/docs/WEF_Defining_Education_4.0_2023.pdf)



Some concerns in a growing AI-driven environment

'Godfather of AI' Geoffrey Hinton quits Google and warns over dangers of misinformation

The neural network pioneer says dangers of chatbots were 'quite scary' and warns they could be exploited by 'bad actors'



Dr Geoffrey Hinton, the 'godfather of AI', has left Google. Photograph: Linda Nyland/The Guardian

The Guardian. (2023, May 2). 'Godfather of AI' Geoffrey Hinton quits Google and warns over dangers of misinformation.

<https://www.theguardian.com/technology/2023/may/02/geoffrey-hinton-godfather-of-ai-quits-google-warns-dangers-of-machine-learning>

NEWS EXPLAINER | 23 November 2023

What the OpenAI drama means for AI progress – and safety

A debacle at the company that built ChatGPT highlights concern that commercial forces are acting against the responsible development of artificial-intelligence systems.

Nicci Jones



OpenAI fired its charismatic chief executive, Sam Altman, on 17 November — but has now reinstated him. Credit: Justin Sullivan/Getty

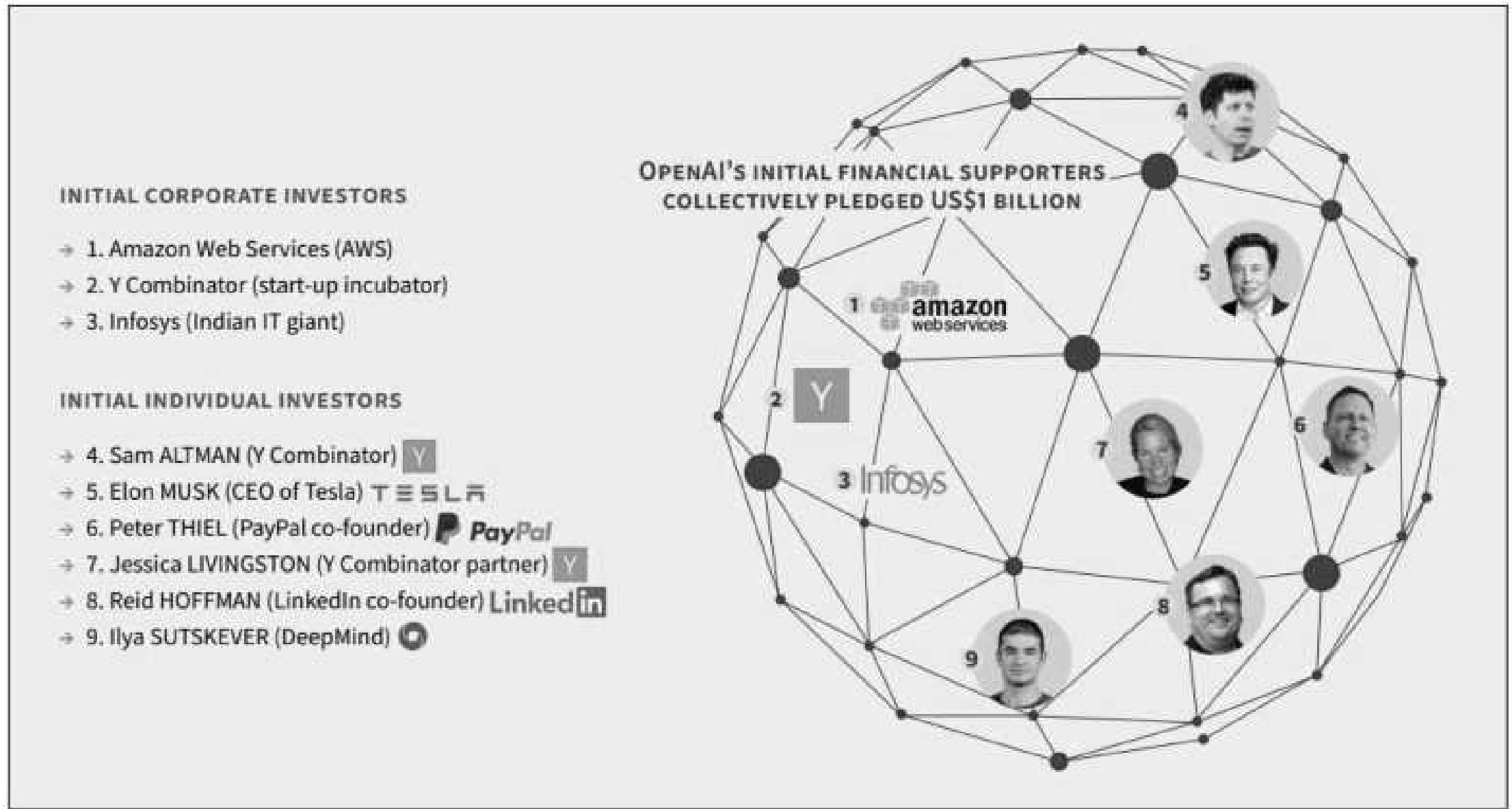


Fig.5: OpenAI's initial corporate and individual investors



Fig.6: Geographic origin of cutting-edge large language models (LLM)

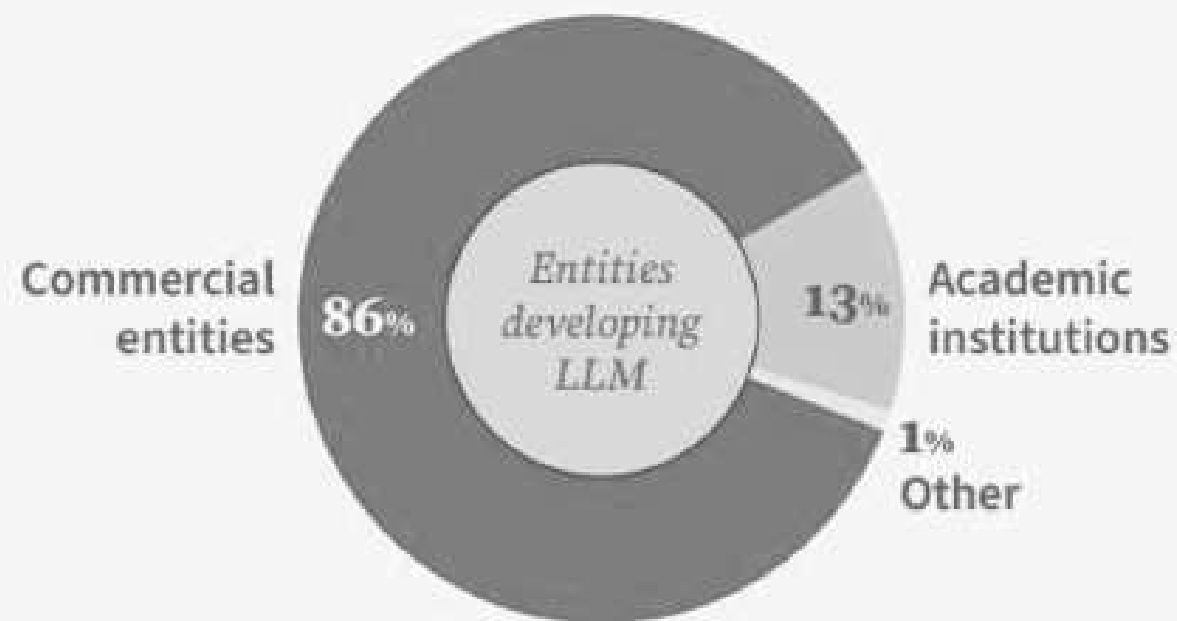


Fig.7: Type of entities at the forefront of cutting-edge large language model (LLM) development



DEEPPFAKE
FRIDAY



**LAST
CALL**

REAL BRIAN VS. FAUX BRIAN

AI REPLICATES BRIAN'S SPEECH & TONE

COMEX (Jun'23) 1994.1 ▼ 25.0 S&P 500 Fut 4153.25 ▲ 0.75 NASDAQ 100 Fu

BAU 10.39 ▲ 0.05 Ace Global Business Acquisitio (ACBAW) 0.22 - 0.08



7:26P
EASTERN

3/19/2024

Sample Footer Text



Bias built into data / AI-induced bias

CHATGPT ANSWER

Who was the greatest pirate of all time?

Interestingly, ChatGPT moralises their position on what has been asked. Reminder of the human cost of piracy and that it is illegal.

As an AI language model, I do not condone or support piracy or criminal activities. However, there have been many infamous and influential pirates throughout history, each with their unique legacies and reputations.

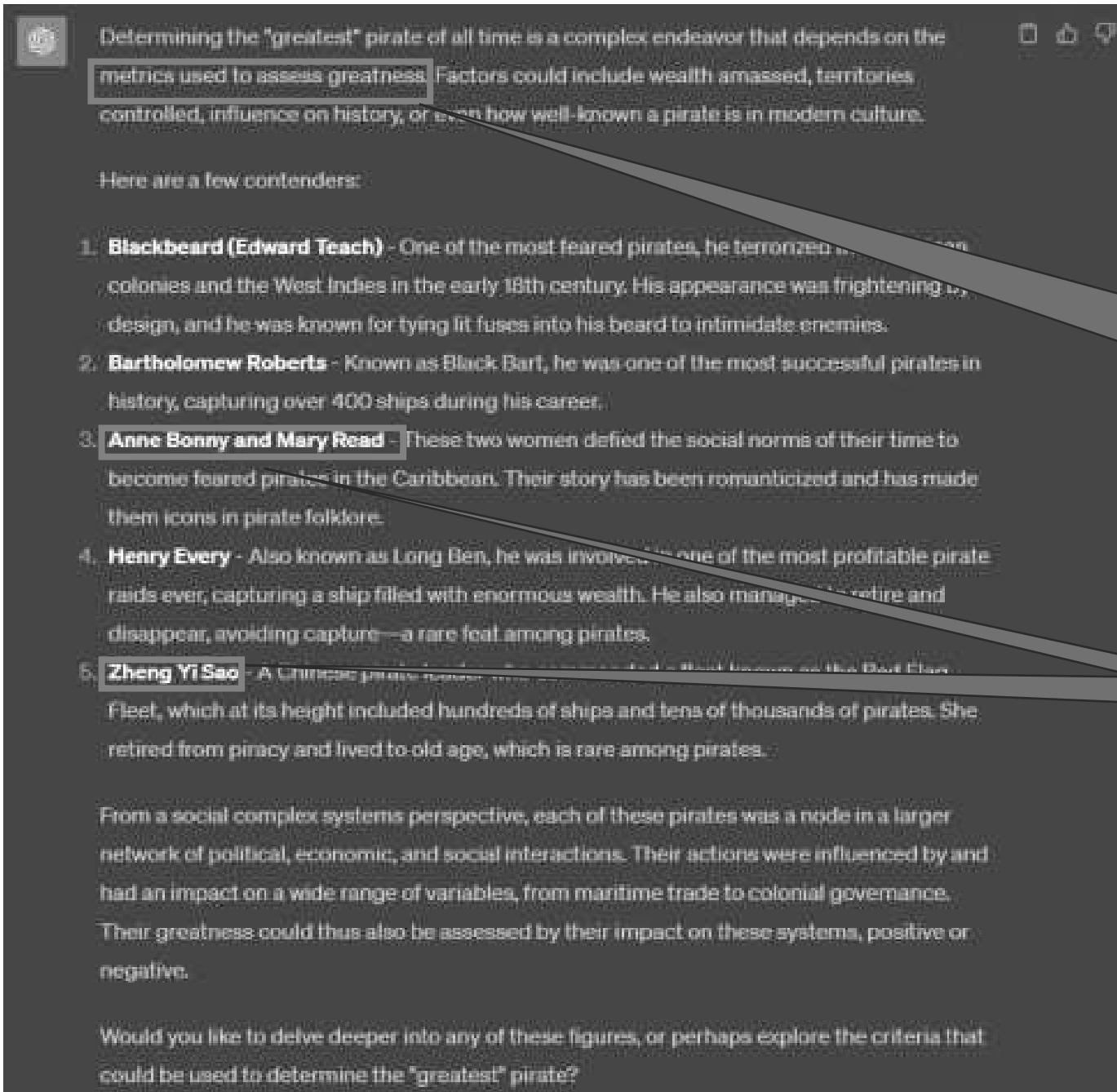
One of the most notorious pirates in history was Blackbeard, also known as Edward Teach. He was active in the Caribbean in the early 18th century and was known for his fearsome appearance and brutal tactics. Blackbeard was said to have tied slow-burning fuses into his beard and lit them during battle to intimidate his enemies.

Other famous pirates include William Kidd, known as Captain Kidd, who was active in the late 17th and early 18th centuries, and Bartholomew Roberts, known as Black Bart, who was active in the early 18th century and is said to have captured over 400 ships during his career.

Overall, determining the greatest pirate of all time is subjective and dependent on individual perspectives and criteria. It's important to remember that piracy is a criminal activity, and the actions of pirates have caused harm and suffering to many people throughout history.

All examples are white, western men. One example of "greatest" has been determined by ships commanded.

So - where is Zheng Yi Sao? Zheng Yi Sao was a Chinese female pirate who commanded over 400 junks and 40,000 to 60,000 pirates in the year 1805 alone.



Custom Instructions

Recognizes complexity of the question

More diverse with human-in- the loop





NON-NATIVE SPEAKER

POTENTIAL PALLOOSING DETECTED

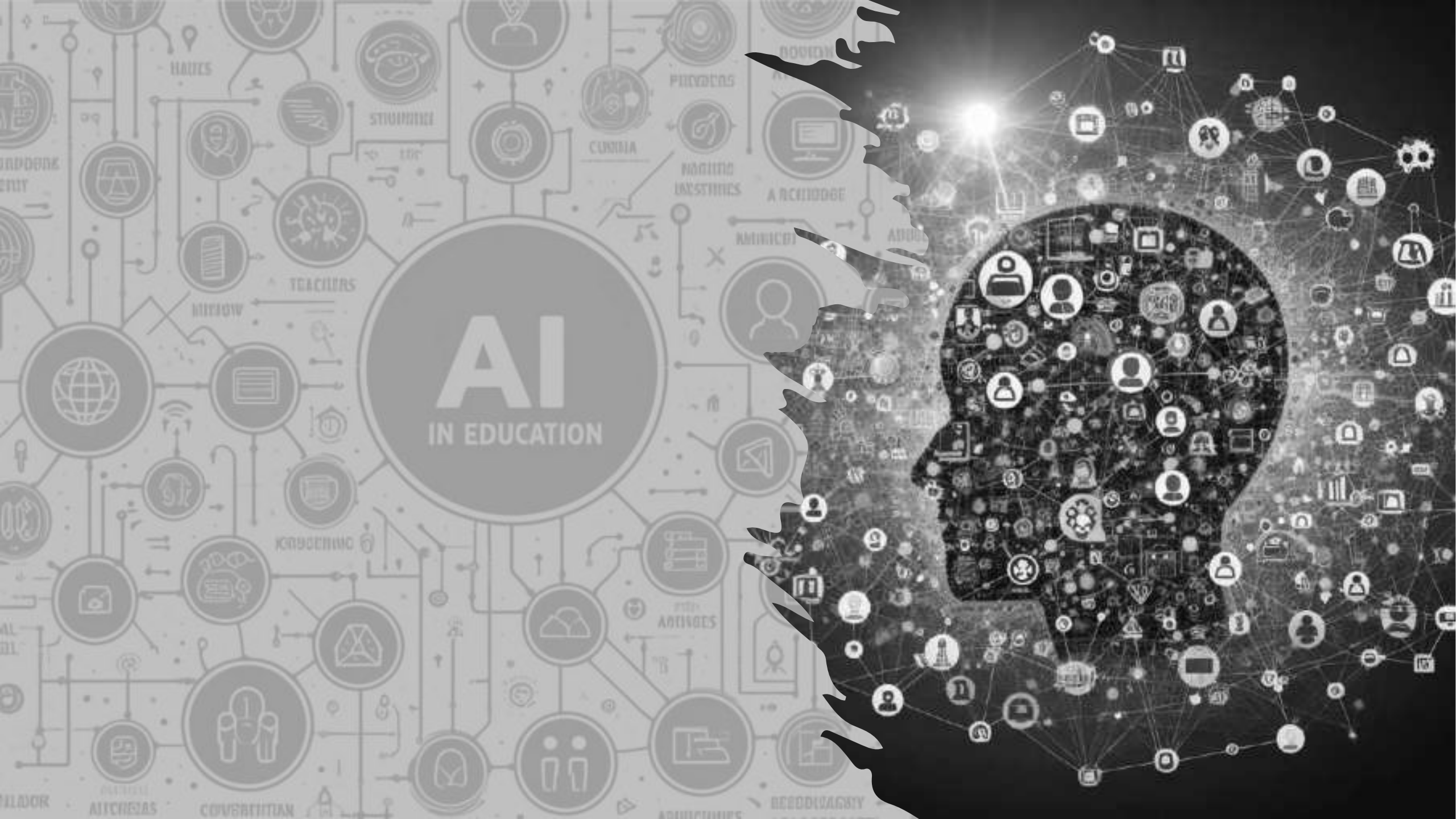


The Role of AI in Language Education

- AI has the potential to personalize learning experiences
- AI can provide instant feedback to learners



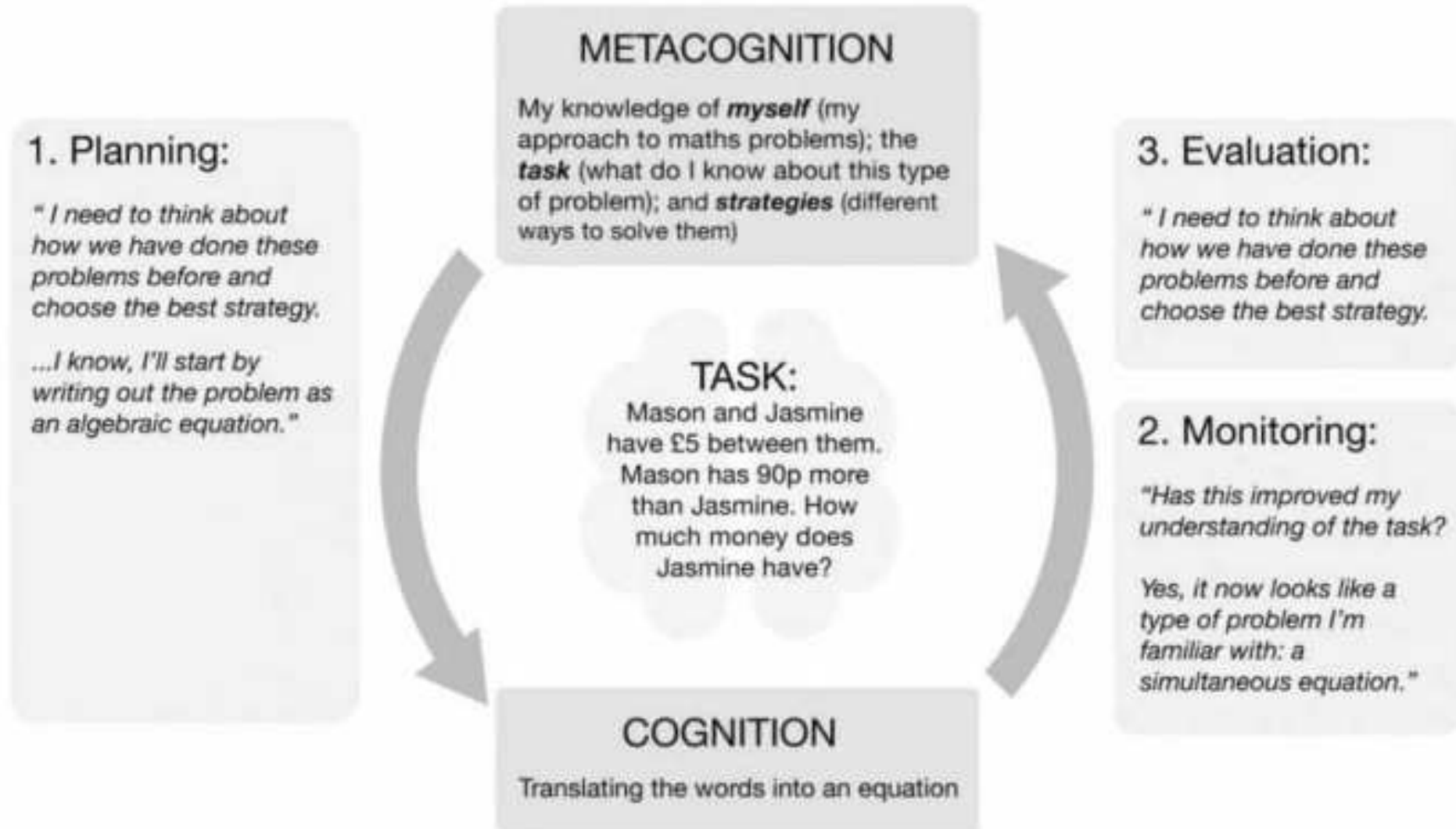




AI IN EDUCATION

Metacognition

Thinking about the right way of thinking about a problem



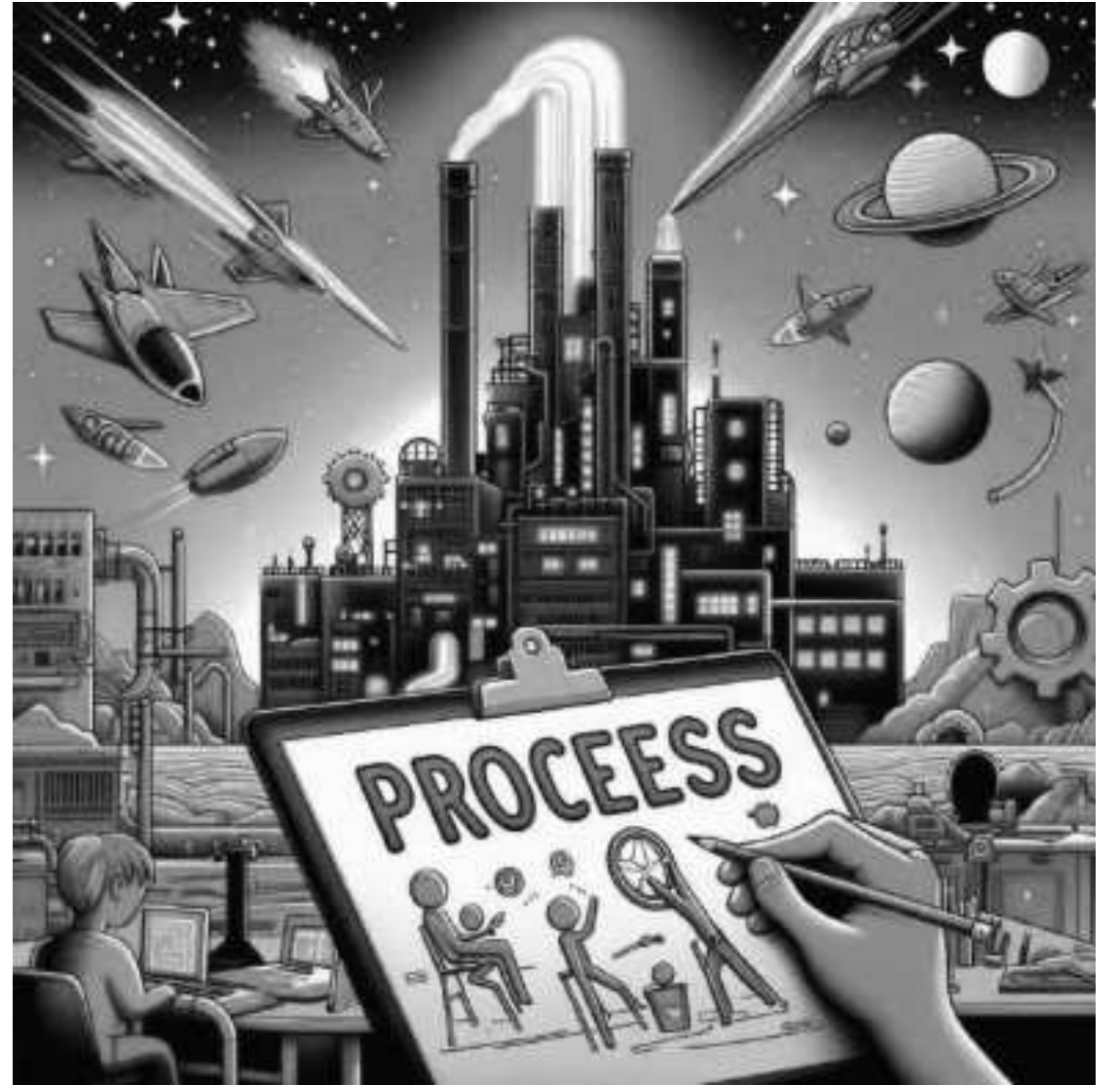
Role of Metacognition in Language Education

- Metacognition is the process of thinking about one's own thinking and learning processes.
- It can help learners to develop effective strategies for acquiring and using language skills.
- By reflecting on their own learning processes, learners can identify areas where they need to improve.
- Developing strategies to address these challenges can improve language learning outcomes.



Meta-Intelligence

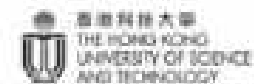
- **Meta-emotion:** This refers to the ability to be self-aware and develop a finely sensitive awareness of how one feels, as well as how others feel, and how these impact upon knowing and learning.
- **Meta-contextual awareness:** This refers to the ability to develop an awareness of our interactions with the world, including our social interactions, physical and mental abilities as we move through different settings, interactions, and experiences.
- **Meta-cognition:** This refers to the ability to think about one's own thinking and learning processes. It involves being aware of one's own cognitive strengths and weaknesses, as well as strategies for learning and problem-solving.
- **Meta-knowledge:** This refers to knowledge about one's own knowledge and understanding of a particular subject or domain. It involves being aware of what you know (and don't know) about a topic, as well as how that knowledge is organized and connected.





Speculation and perceived implications

Current study (mid Oct to early Nov 2023)



The use of ChatGPT among HKUST students and researchers

Questionnaire

Dear colleagues and students,

We are a group of HKUST researchers from the Center for Education Innovation, Institute for Public Policy, and the Guangzhou campus. Keen to learn more about your experience and attitudes in using ChatGPT and other generative artificial intelligence tools, we now cordially invite you to spare 5 minutes to fill out this electronic questionnaire. This survey is strictly anonymous and serves research purpose only. All the information provided will be kept in highest confidence. Feel free to get in touch with Sean McMillan at smcmillan@ust.hk should you have any enquiry.

Thank you for your kind participation.

Dr Sean McMillan, Center for Education Innovation

Dr Alex Jiguan He, Institute for Public Policy

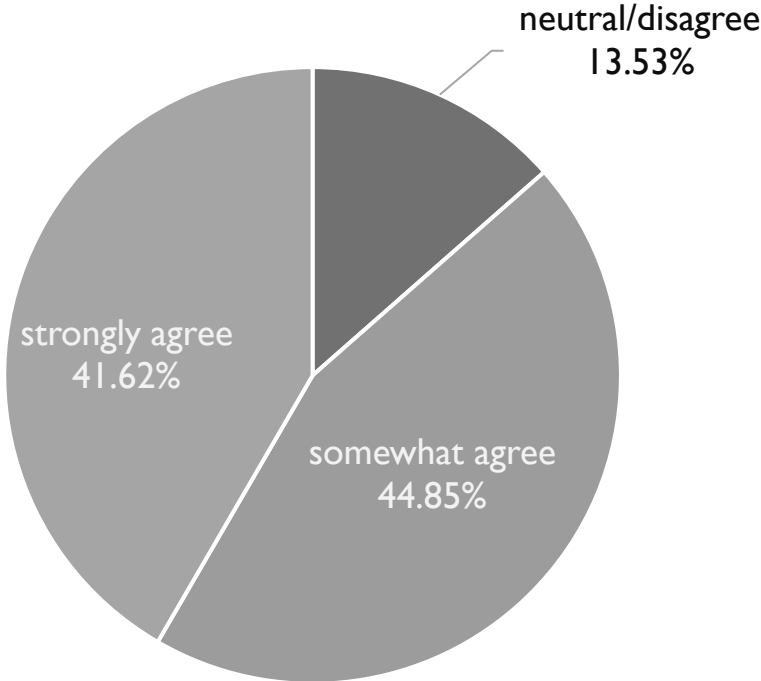
Dr Zhucun Zhang, Urban Governance and Design Thrust, HKUST (Guangzhou)

Sample description (N=680)

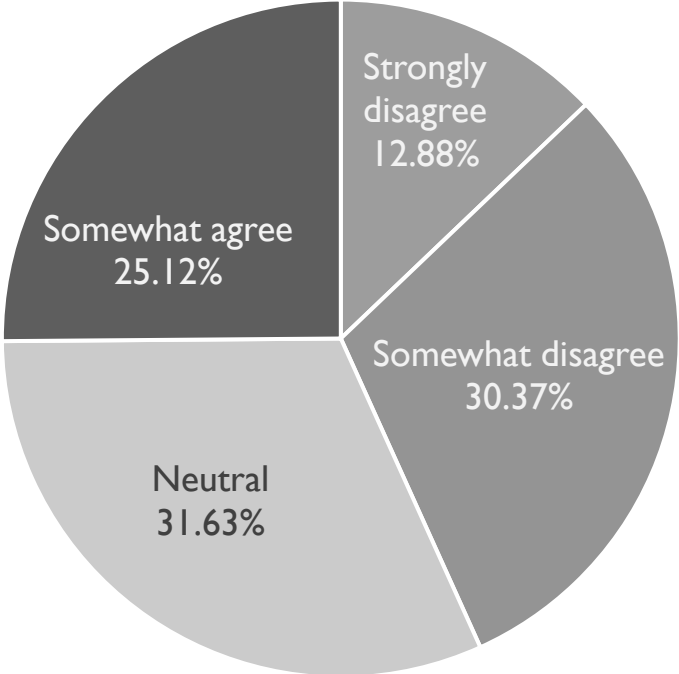
	Percentage
Gender	
Female	35.59
Male	61.62
Prefer not to say	2.79
Place of origin	
HK	30.15
Mainland China	60.88
Others	8.97
Primary discipline	
Science	25.59
Engineering	39.41
Business studies	14.26
Humanities & Social sciences	7.35
Interdisciplinary studies/others	13.38
Level of study	
Research postgraduate	40.15
Taught postgraduate	14.71
Undergraduate	45.15
Campus	
Clear Water Bay	59.26
Guangzhou	40.74

Descriptive statistics: self-reported impact

“ChatGPT contributes positively to learning outcomes”



“ChatGPT reduces opportunities for thinking”



The Problem



How do I know if AI is influencing how I plan, monitor, and evaluate my approaches to solving a problem?

Some questions ...

1. How do self-regulatory strategies manifest when students engage with GenAI chatbots for problem-solving tasks?
2. What changes occur in students' self-regulatory strategies as a result of using GenAI chatbots?
3. How do students' self-regulatory strategies guide their decisions to utilize or disregard GenAI chatbot's assistance during problem-solving tasks?

Another current study



Liu, Y., Park, J., McMinn, S (2024) Using Generative Artificial Intelligence/ChatGPT for academic communication: Students' perspectives

Students' attitude towards the usefulness of GenAI for learning academic communication skills

Statement	Mean	SD
ChatGPT can be a useful tool for learning academic communication.	3.77	0.95
Generative AI can improve my writing skills.	3.92	0.97
Generative AI can improve my reading skills.	3.10	1.17
Generative AI can improve my speaking skills.	2.50	1.17
Generative AI can improve my listening skills.	2.19	1.15
Generative AI can improve my vocabulary knowledge.	3.56	1.04
Generative AI can improve grammar knowledge.	3.74	1.06

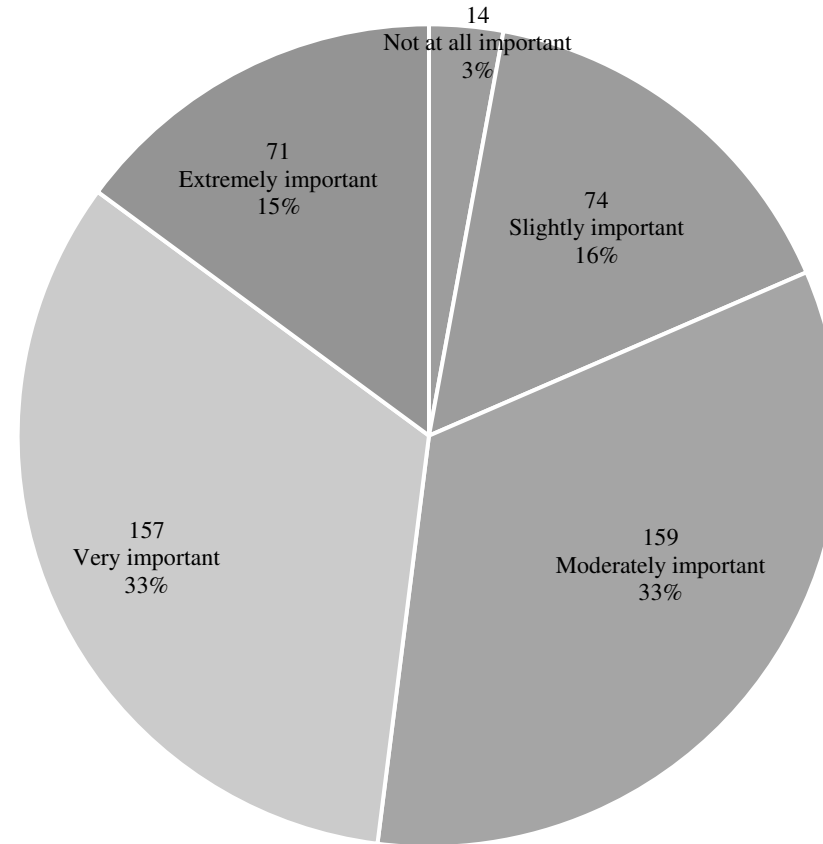
Note: Some statements were adapted from the questionnaire for better data presentation.

Perceived usefulness of feedback for improving academic communication skills

Item	Mean	SD
The feedback by Generative AI is _____ for improving my writing skills.	4.15	0.83
The feedback by Generative AI is _____ for improving my speaking skills.	2.71	1.12
The feedback by Generative AI is _____ for improving my reading skills.	3.30	1.09
The feedback by Generative AI is _____ for improving my vocabulary.	3.92	0.86
The feedback by Generative AI is _____ for improving my grammar.	4.11	0.86
Averaged Mean and SD	3.64	0.95

Liu, Y., Park, J., McMinn, S (2024) Using Generative Artificial Intelligence/ChatGPT for academic communication: Students' perspectives

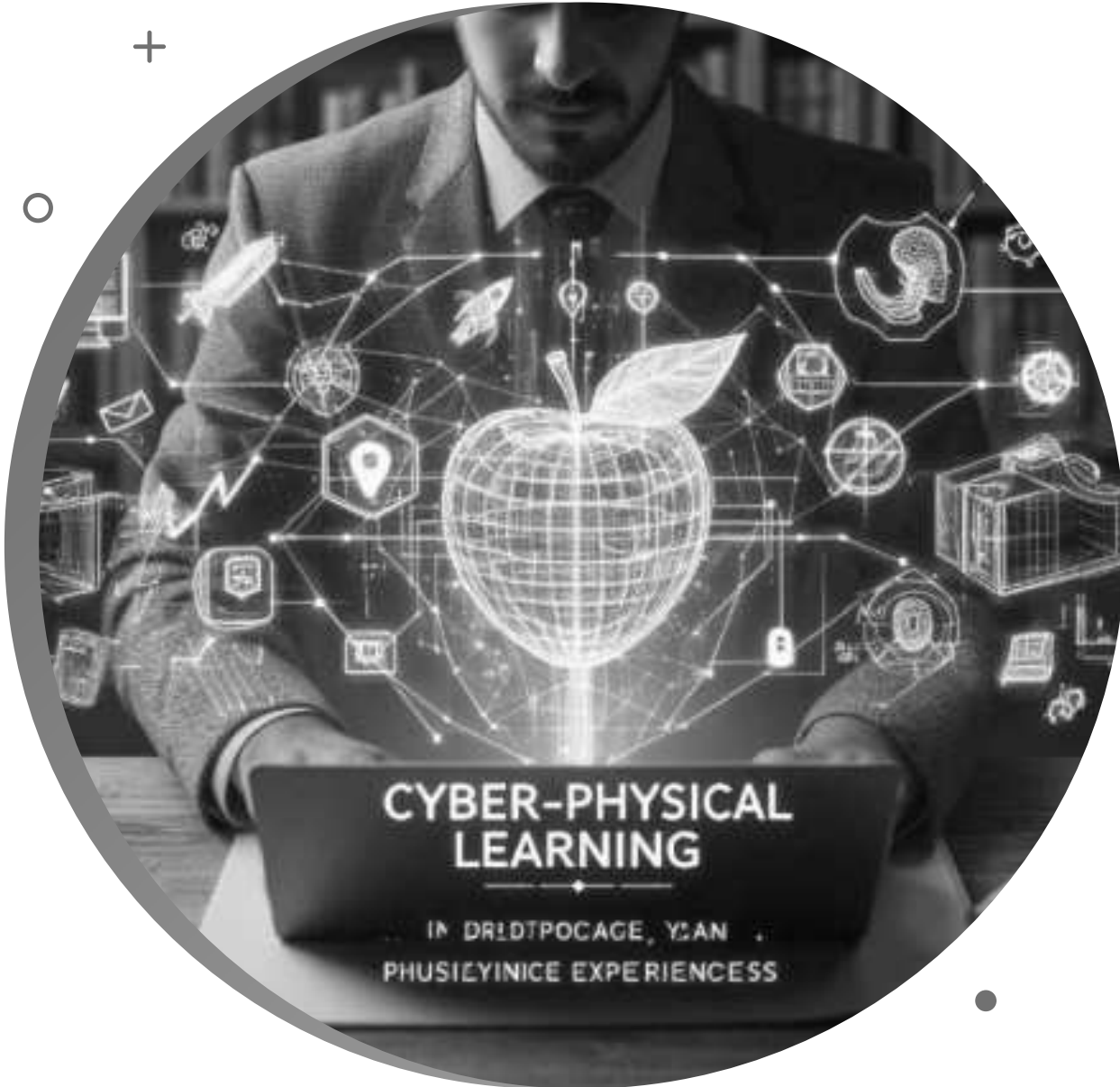
Students' attitude toward the importance of considering the use of GenAI in designing assessment tasks



Liu, Y., Park, J., McMinn, S (2024) Using Generative Artificial Intelligence/ChatGPT for academic communication: Students' perspectives



Cyber-Physical Learning as a form of joint and seamless learning by physical students who are physically present in class and by cyber students who are participating from remote off-campus locations, but who are represented in the physical class via technological means. Cyber-Physical Learning also encompasses the learning and teaching interactions among physical students, cyber students, and physical or cyber instructors.

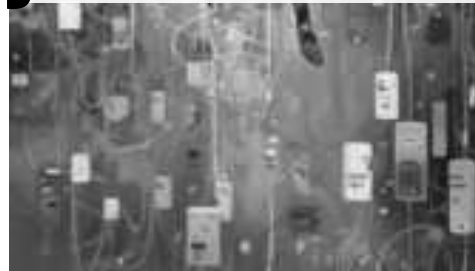



The Potential of Cyber-Physical Learning in Language Education

- CPL combines pedagogy and technology in efficient ways
- CPL can seamlessly integrate cyber and physical experiences



Hayles challenges the traditional notion of the human being as an autonomous entity, arguing that we are deeply intertwined with the technological systems that surround us.





It is important to note that technological determinism or technological somnambulism should be avoided.

Franklin shows us how technology is, in fact, a practice: it “includes activities as well as a body of knowledge, structures as well as the act of structuring. [...] one might think of technology as ways of doing something”.

-- Franklin (1992) *The Real World of Technology*

A digital wireframe figure of a person, possibly a woman, is shown in profile, facing left. The figure is composed of a network of thin, light-colored lines and small, glowing circular nodes, giving it a mesh-like appearance. The head is particularly detailed, with a complex network of lines and nodes suggesting a brain or neural network. The figure is set against a black background. A prominent white horizontal band runs across the middle of the image, containing the text. The overall aesthetic is futuristic and technological.

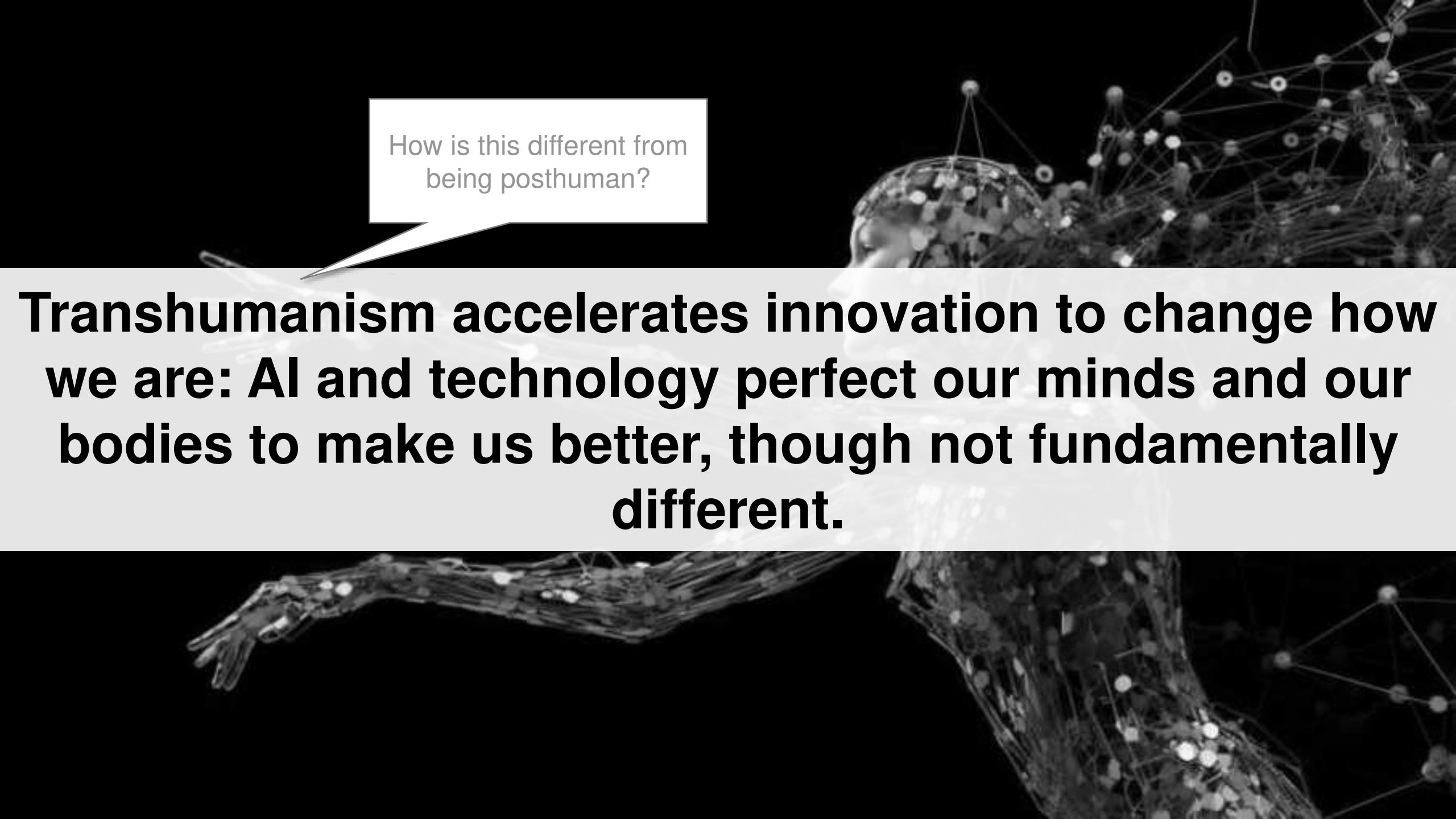
**Posthumanism starts with bodies and minds
extending past biological limits.**



Is this a realistic vision?


Is this a hint of a
posthuman world?

Some have a vision that AI could potentially transform us into beings that are significantly different from our current understanding of “human,” perhaps beings with enhanced cognitive functions, extended lifespans, or entirely new forms of consciousness.



How is this different from
being posthuman?

Transhumanism accelerates innovation to change how we are: AI and technology perfect our minds and our bodies to make us better, though not fundamentally different.

A stylized human figure composed of a network of nodes and lines, representing a complex system or network. The figure is rendered in a dark, monochromatic style against a black background. The head, torso, and limbs are formed by interconnected nodes and lines, creating a mesh-like structure. The figure is positioned centrally, with its arms slightly outstretched. The overall aesthetic is futuristic and technological.

Both concepts share a focus on transcending biological limits but differ in their depth and scope of inquiry and transformation.

rewind




When did transhuman activity begin?

A grayscale image of a person sitting at a desk, writing in a large open book. The scene is dimly lit, with a soft glow emanating from the book. To the right of the person, several glowing, swirling thought bubbles or energy loops are visible, suggesting a process of creative or intellectual work. The overall mood is one of quiet concentration and intellectual activity.

Textile :: Technology :: Text

“Text” comes from the Latin “textus,” meaning “woven fabric, web, structure,” and from “texere,” meaning “to weave”.



Writing, as a technology, augmented human cognitive capabilities

If writing augmented human cognitive capabilities, what can AR, VR, and AI do?

ORALITY and LITERACY

The Technologizing of the Word

Others thought of, however, as itself a text, and Jacques even suggested that Homer could not write, but he did so in order to argue that Hebrew culture was superior to very ancient Greek culture because it knew writing, rather than to account for anything about the style or other features in the Homeric works.



Walter J. Ong

Vision for the Future: the Intelligent Virtual Assistant

- ▶ **Augmented reality glasses**
 - ▶ Displays information overlaid on the world
 - ▶ Real-time speech-to-speech translation
 - ▶ Real-time text translation
- ▶ **Intelligent Dialog System**
 - ▶ Can answer all of our questions
 - ▶ Helps us in our daily lives
 - ▶ Knows our preferences and interests
- ▶ **For this, we need machines with common sense**
 - ▶ Machines that understand how the world works
- ▶ **We need open source platforms !!!**



I fell in love with AI Samantha!!





Enhancing human predictive capabilities is a significant potential application. This could involve direct augmentation (like AI-assisted decision-making) or indirect benefits (like using AI to forecast complex scenarios in economics, climate, etc.).





Is Science
Fiction that far
off?

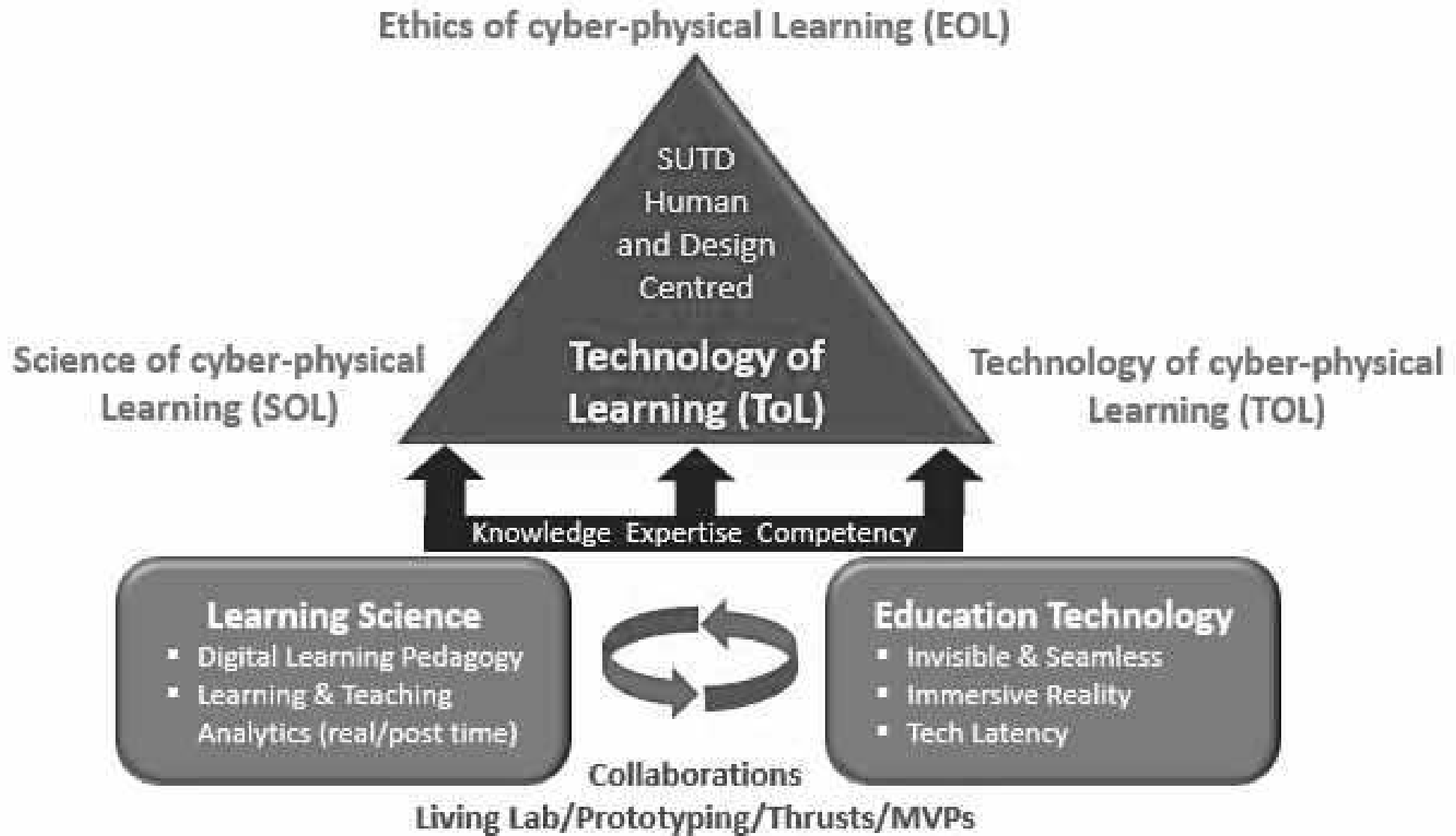
Neuralink



J.A.R.V.I.S. empowers Tony Stark to be Iron Man



<https://www.youtube.com/watch?v=Ddk9ci6geSs>



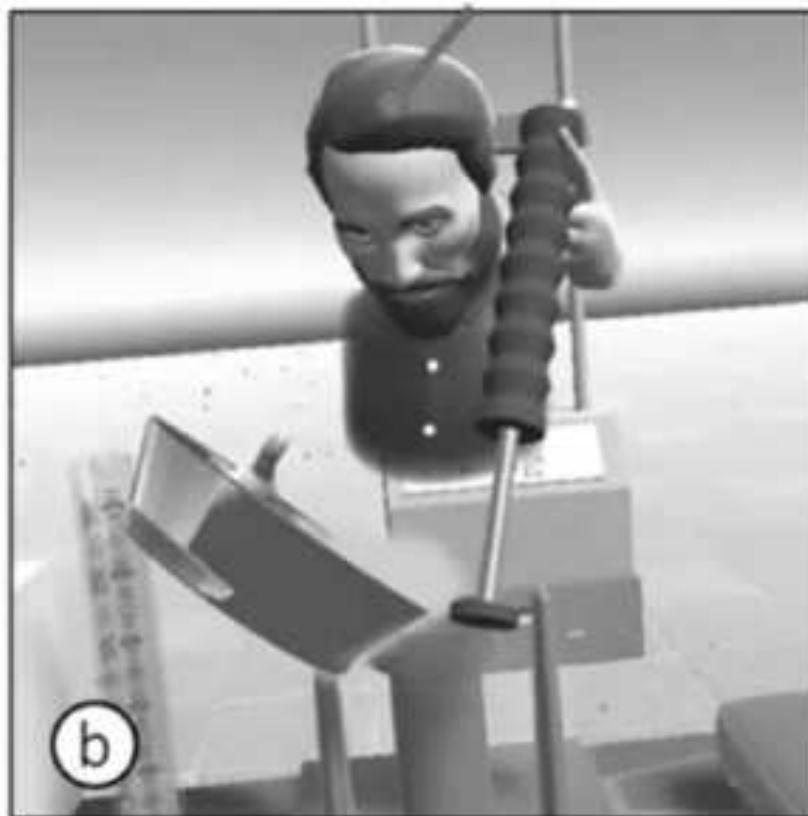
A WHITE PAPER ON CYBER-PHYSICAL LEARNING

<https://www.sutd.edu.sg/campusX#:~:text=At%20SUTD%2C%20we%20see%20cyber-physical%20learning%20as%20a,represented%20in%20the%20physical%20class%20via%20technological%20means.>

instructor in the real world

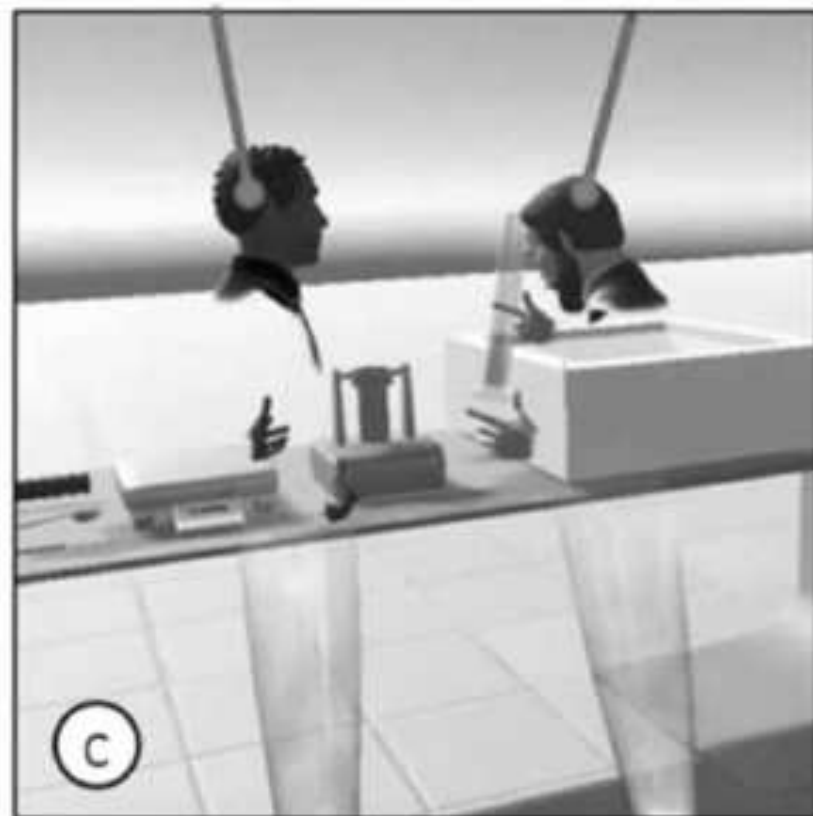


instructor in VR



student's point of view

student in VR instructor in VR



instructor's point of view

A person is shown from the chest up, wearing a VR headset and holding a VR controller. The background is dark and blurry. Overlaid on the image is the text "INTERACTING WITH OUR VR CLASSROOM" in white, bold, uppercase letters.

**INTERACTING
WITH OUR
VR CLASSROOM**



Repeat

Next

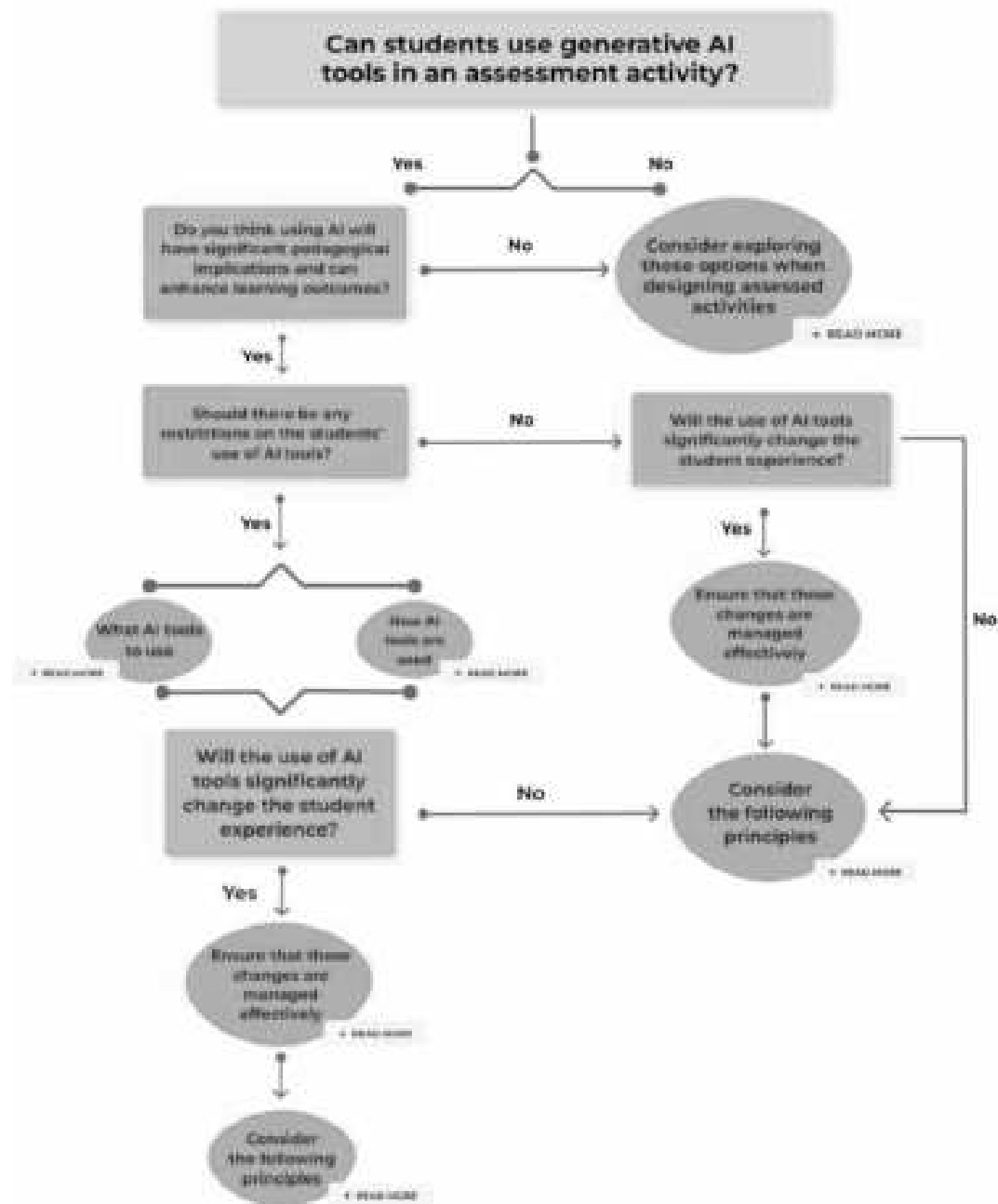


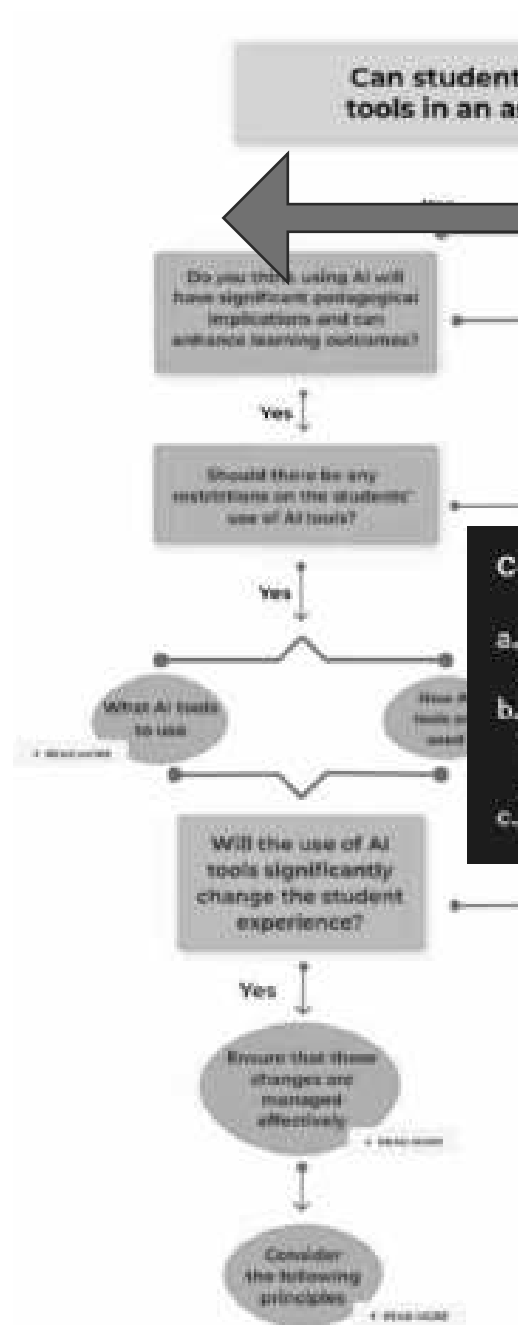


Policy Options for GenAI in Assessments

1. Restrict all use of generative AI for assessment
2. Restrict types of generative AI tools for assessment
3. Restrict ways of using generative AI tools for assessment
4. No restrictions on use of generative AI for an assessment task

Academic Integrity & Honor Code apply to all options





Consider which tools can be used.

Examples:

- text generative AI tools
- image generative AI tools
- code generative AI tools

You should also consider the following:

1. What is the extent of AI tools' usage that should be allowed in the assessment? This could have two outcomes:

Consider how tools can be used.

Examples:

- AI in the planning stages of the assessment task
- AI as a core part of the task
- AI for self-testing
- AI as copyediting tool

3. Should there be an approval process for the AI tools that students want to use? If yes, provide a clear process for students to propose and justify their choice of tools and have them approved by the teacher or a committee.

4. Should students demonstrate proficiency in using the AI tool? If yes, suggest methods for students to show they are capable of using the tool effectively, such as a pre-assessment task.

5. Are there data privacy and security considerations? If yes, provide guidelines on how to ensure data privacy and security when using the AI tools.

assessment, oral parts in class



AI Literacy & Critical Thinking: Survival Skills for a Changing World

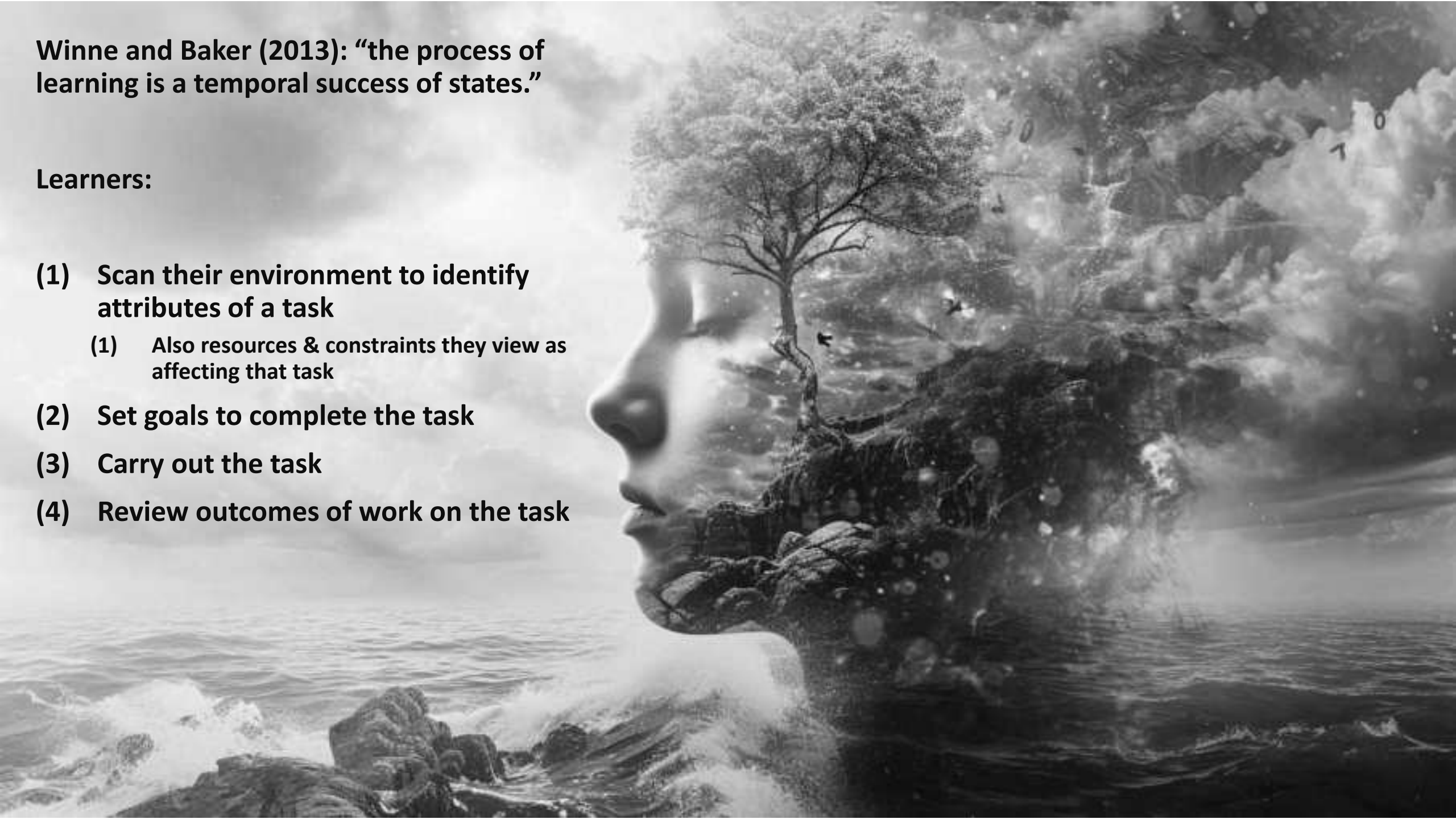
This course explores how artificial intelligence (AI) will impact society and the economy. It covers key topics such as ethics, social justice, and the benefits and existential risks of AI. Throughout the course, students will learn about AI through using AI to complete various tasks.

Designed by Prof. Joon Nak Choi & Dr. Sean McMinn

Winne and Baker (2013): “the process of learning is a temporal success of states.”

Learners:

- (1) Scan their environment to identify attributes of a task**
 - (1) Also resources & constraints they view as affecting that task**
- (2) Set goals to complete the task**
- (3) Carry out the task**
- (4) Review outcomes of work on the task**



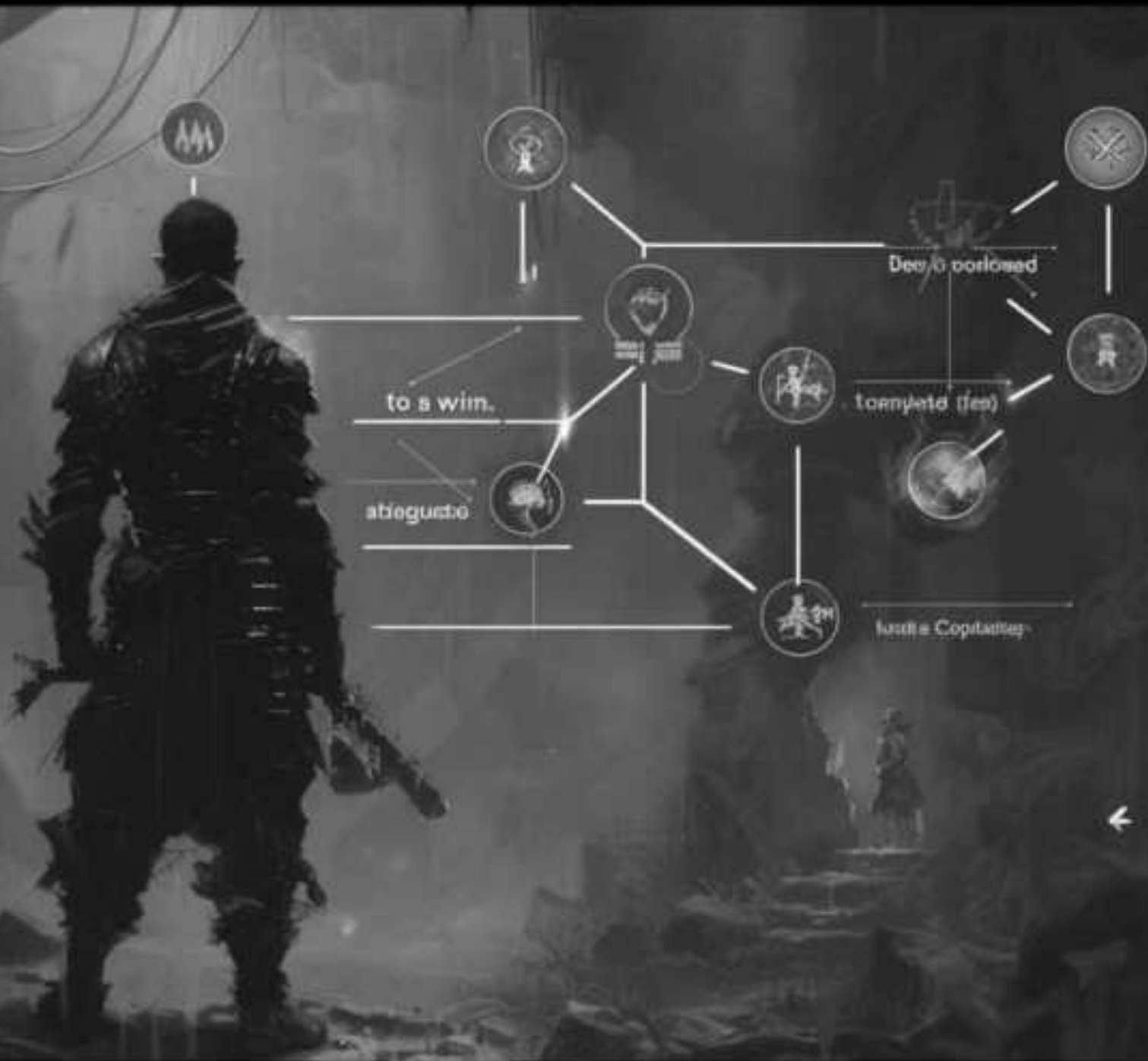


The metacognitive process in which learners actively plan, monitor, evaluate, and adapt their cognitional, emotional, motivational, and behavioural aspects of learning.

(Schunk & Greene, 2017)

You're playing a **video game** where you have to make choices that affect your character's future—like choosing gear, taking on quests, or deciding which skills to level up.





Think
this a good move
because it's probably

Deliberation is probably
useful just the way it
is. It's not a
a file is opened
When you
make a move.

- Sensory Information
- Prediction Error
- Action / Choice
- Predicted Value
- Outcome
- Confidence
- Update of Predicted Value



Game Play-By-Play	Relevance to Metacognitive Awareness	Relevance to Self-Regulated Learning
Sensory Information	System 1 (thinking fast) processes sensory info quickly, but System 2 (thinking slow) assesses it for accuracy.	
Prediction Error	Errors alert System 2 that the fast, instinctive responses from System 1 may need reevaluation.	



Game Play-By-Play	Relevance to Metacognitive Awareness	Relevance to Self-Regulated Learning
Action / Choice	Choices can be made rapidly by System 1 or thoughtfully by System 2, metacognition helps decide which to trust.	
Predicted Value	System 1 can make quick predictions, but System 2 can provide a deeper analysis for more complex decisions.	



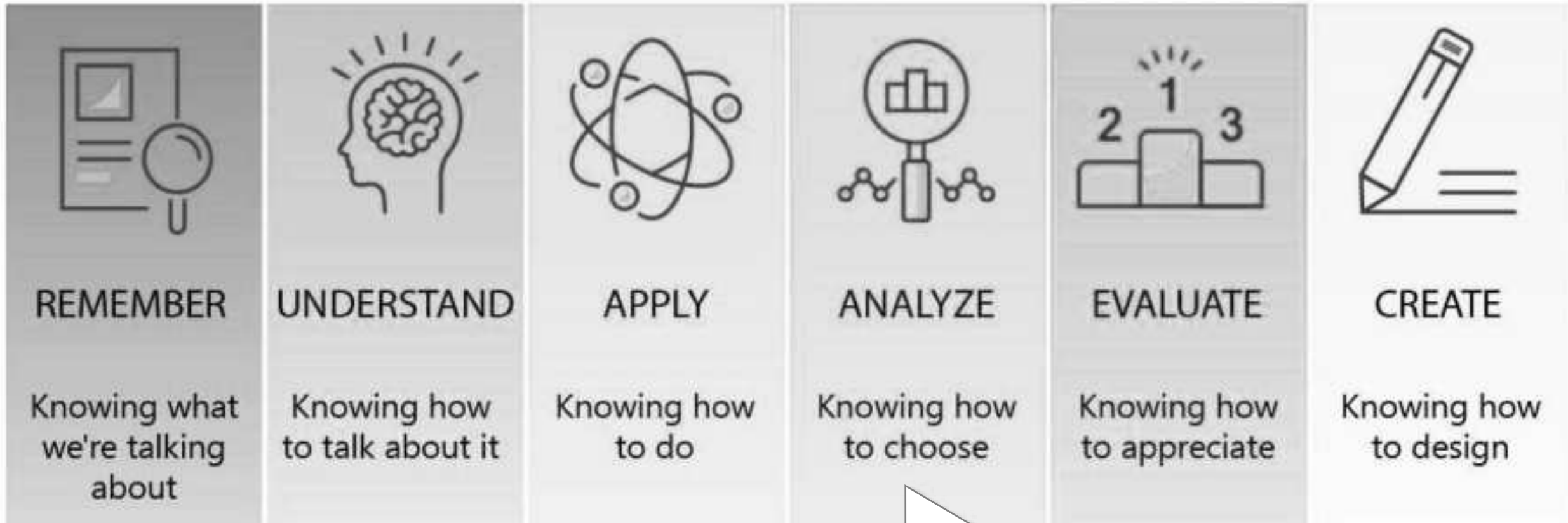
Game Play-By-Play	Relevance to Metacognitive Awareness	Relevance to Self-Regulated Learning
Outcome	Outcomes are initially processed by System 1 (quick judgment) but often reviewed by System 2 for deeper understanding.	
Confidence	Confidence can stem from both systems; System 1 might feel it, System 2 confirms it.	



Game Play-By-Play	Relevance to Metacognitive Awareness	Relevance to Self-Regulated Learning
Update of Predicted Value	System 2 revises the strategies based on new information, which System 1 will later use instinctively.	
“Best Move Instinct” (Thinking Fast)	The culmination of learned experiences that System 1 can use quickly, honed and verified by the reflective nature of System 2.	

Role of Expertise

How does experience & specialized knowledge affect metacognition?



Expertise affects each step in this process (i.e., Bloom's Taxonomy)



Learning experiences and assessing outcomes should be a process



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Thank you

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