Welcome! Creative and Critical Thinking with Generative AI

Before the Session	During the Session	After the Session
Let us know if our **audio** and **screen** are sharing	**Turn off your mic** until the Q&A	Complete the **feedback survey** (link via email)
Turn on **live captions** if you like closed captioning [Select More… > Language and speech > Turn on live captions]	Share your questions and comments in the **chat**	Review the **session resources** when posted

In the chat, introduce yourself and share what brought you to today's session.

Creative and Critical Thinking with GenAI

January 30, 2025| 1:00 pm – 2:30 pm

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Access Check

We understand access to be a shared responsibility between everyone in this space. We will strive to create an accessible space that reduces the need for you to disclose a disability or impairment for the purposes of gaining an accommodation. In doing this together, we strive to welcome disability, and the changes it brings, into our space.

Is there anything about the virtual space (display, sound, speaking speed, etc.) that we should address now?

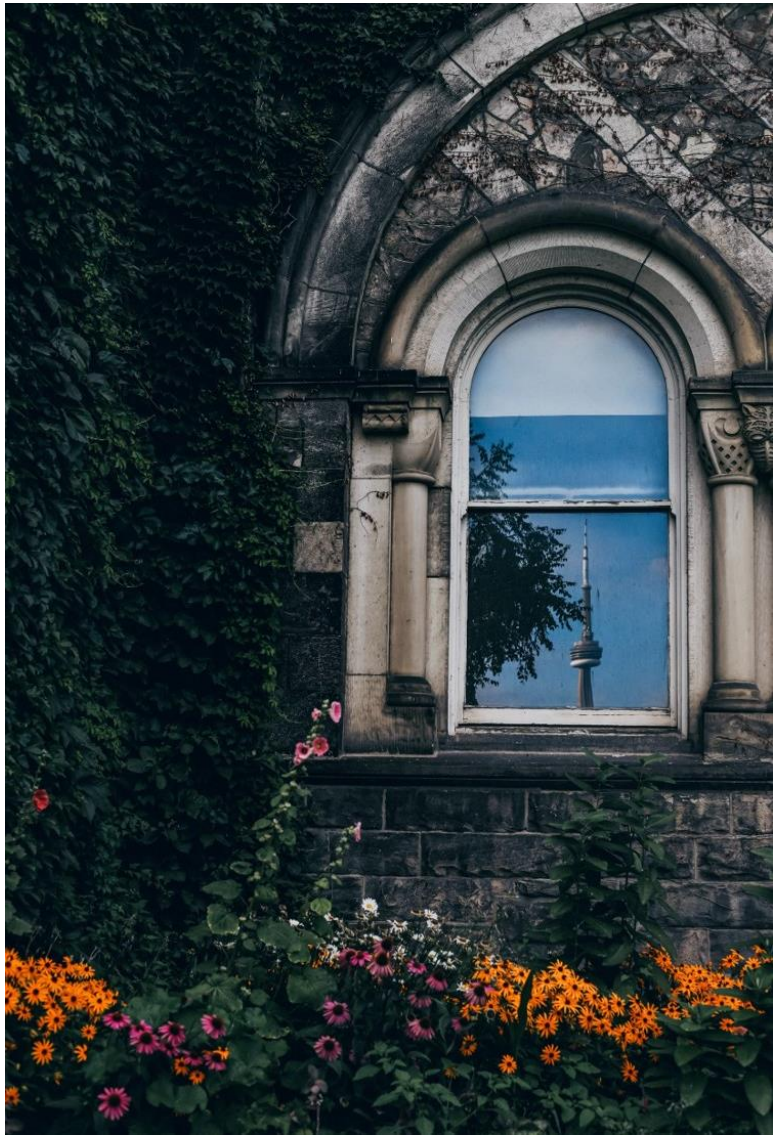
Are there any other access needs that might affect your participation in the conversations that we could also address?

Land Acknowledgement

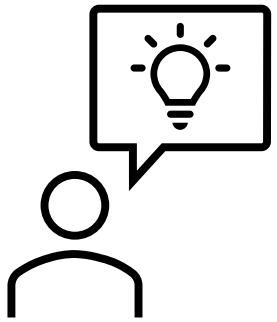
We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Revised April 2021 by the Elders Circle (Council of Aboriginal Initiatives)

U of T Land Acknowledgement

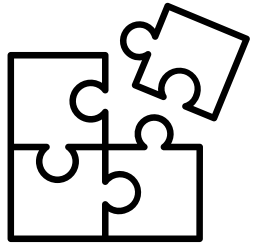


Today's Goals



Defining Frameworks

- Explore what creative and critical thinking are, and how these features of human thought relate to AI use



Integrating AI Strategies

- Explore strategies for incorporating AI into teaching, to support creative and critical thinking

Mitigating Risks

- Identify potential strategies to mitigate risks posed by AI use

U of T Guidelines: GenAI as Learning Aid

“Undergraduate and graduate students may use GenAI tools as learning aids, for example, to summarize information or test their understanding of a topic. These tools should be used in a manner similar to consulting library books, online sources, peers, or a tutor.

Such uses are generally acceptable even if an instructor has stated that AI tools are not otherwise permitted in the course. These uses typically do not need to be cited or disclosed.”

Updated: August 29, 2024

University of Toronto ”Enterprise" Copilot

Copilot

Microsoft 365

- Microsoft Copilot is 'mostly' ChatGPT
  - **Can be used to replace what you might do in ChatGPT:**
    - Leverages the latest models of OpenAI
    - Summarize documents, generate images, write code
    - Access the web to find references related to its responses
    - Use your own files as 'knowledge' it can use to respond
  - **Different than ChatGPT:**
    - It does not use your data for training
    - Data is not saved or used by Microsoft. All data remains on our UofT tenant
    - We have the "enterprise" version of Copilot, not the Microsoft "365" version

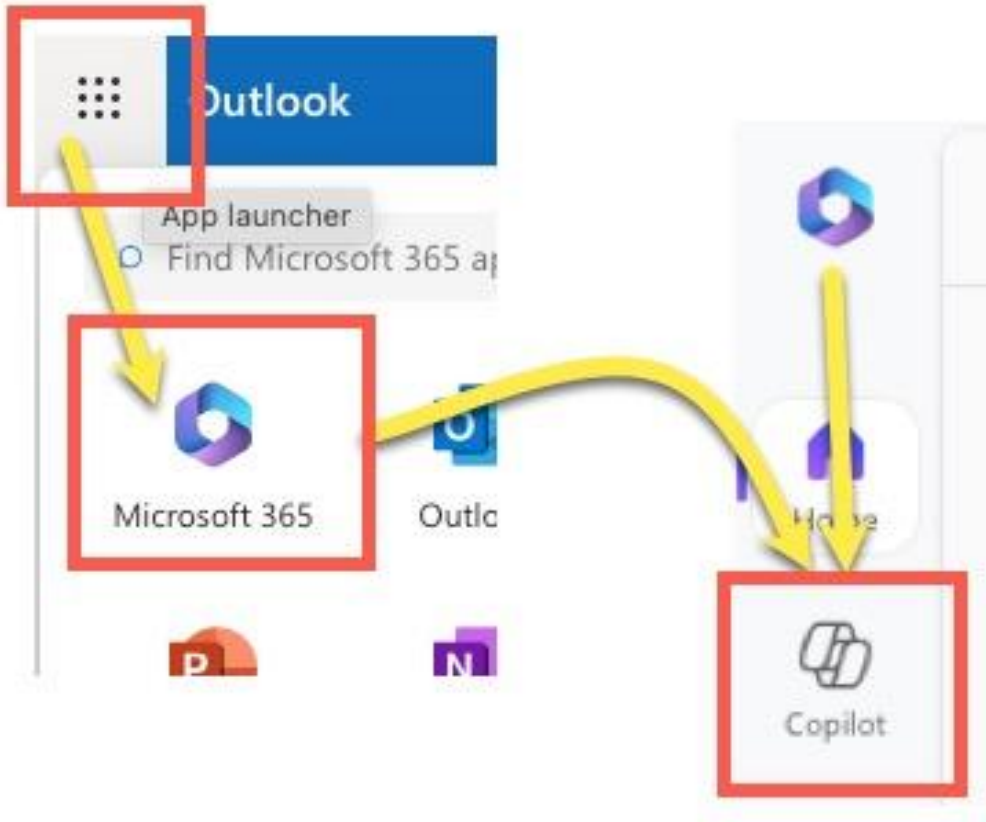
uoft.me/copilot

University “Enterprise” Copilot:

1. Login to Outlook email

2. **Select the “waffle”**
   (the 9 dots icon in the top left corner)
   choose “Microsoft 365”.

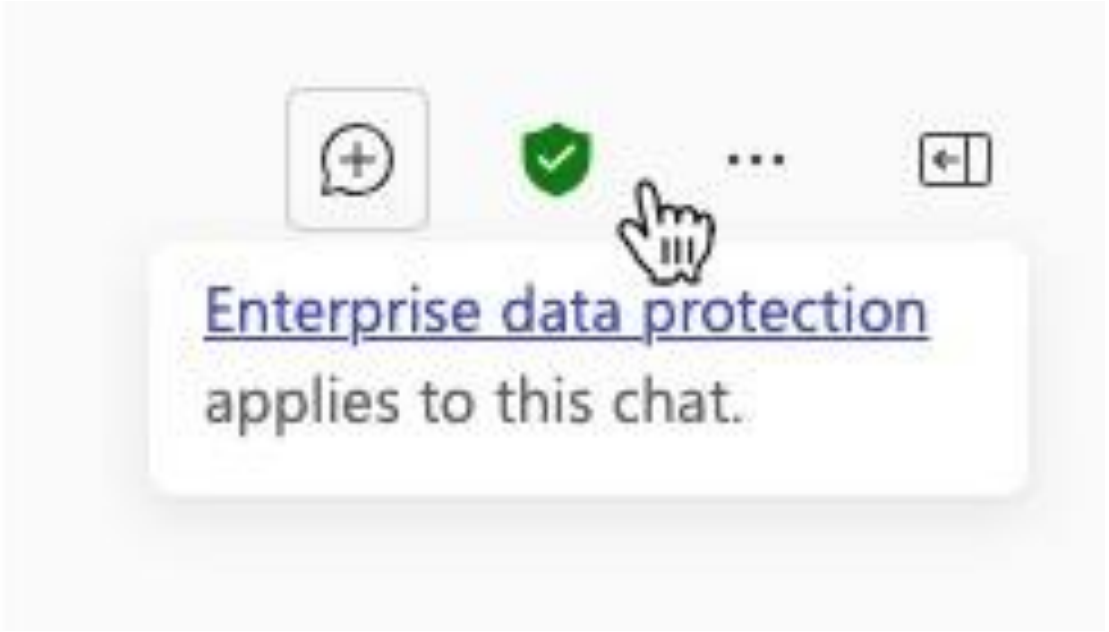
3. **Choose “Copilot”**
   (located in the left side menu,
   just below the Home icon.)



m365.cloud.microsoft/chat

University “Enterprise” Copilot:

Verify you see the enterprise shield icon:



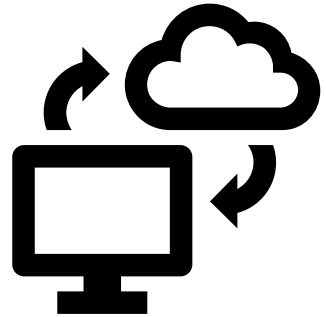
m365.cloud.microsoft/chat

Chatterfall activity using Copliot

Step 1: Enter the prompt into the University of Toronto Microsoft Copilot

- This prompt will also be posted in the chat for you to select and copy into Copilot
- Remember to change [insert course] with your actual course name

"*I am a faculty member teaching [insert course] at the University of Toronto. Please give me in 5 words or less, one way that I can use generative AI to support my creative and critical thinking.”*



Step 2: Copy the response from Copilot (5 words or less)

Step 3: Paste into the chat but do not hit enter yet

Step 4: After about 1 minute, we will announce when you can enter

Creativity and Generative AI

What is Creativity?

cre·a·tiv·i·ty

/ˌkrēāˈtivədē/

noun

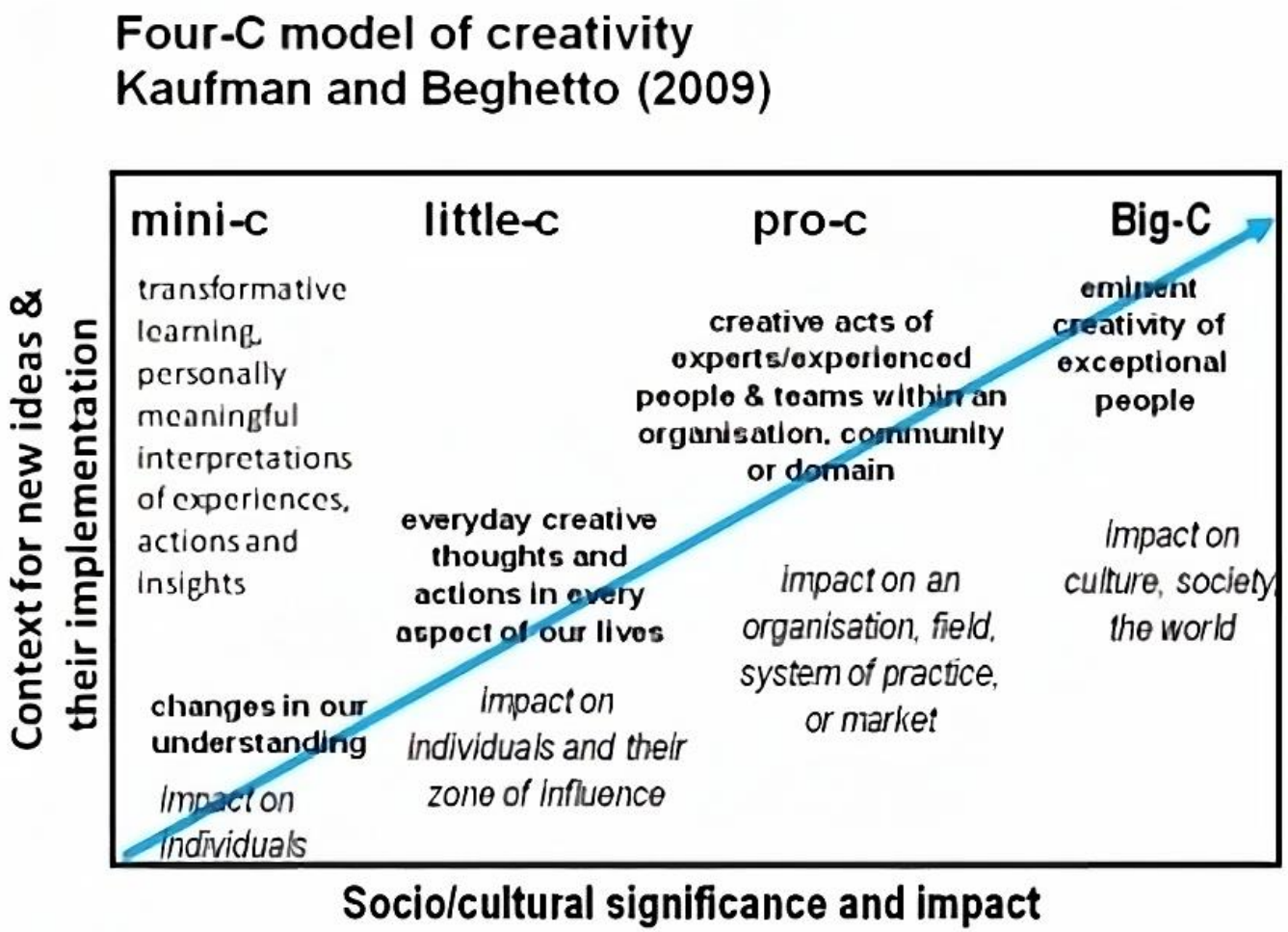
noun: **creativity**

the use of the imagination or original ideas, especially in the production of an artistic work.
"firms are keen to encourage creativity"

Similar: inventiveness, imagination, imaginativeness, innovation, innovativeness, originality, individuality, artistry, expressiveness, inspiration, vision, creative power, creative talent, creative gift, creative skill, resourcefulness, ingenuity, enterprise

Use over time for: creativity

Four-C model

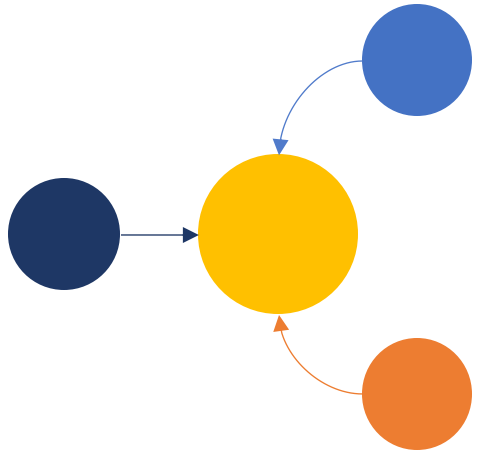

Four-C model of creativity
Kaufman and Beghetto (2009)
mini-c
little-c
pro-c
Big-C
transformative learning, personally meaningful interpretations of experiences, actions and insights
everyday creative thoughts and actions in every aspect of our lives
creative acts of experts/experienced people & teams within an organisation, community or domain
eminent creativity of exceptional people
changes in our understanding
Impact on individuals
Impact on individuals and their zone of influence
Impact on an organisation, field, system of practice, or market
Impact on culture, society, the world
Context for new ideas & their implementation
Socio/cultural significance and impact

Creativity as craft

Creativity as Craft

Glaveanu (2018)

Honing theory



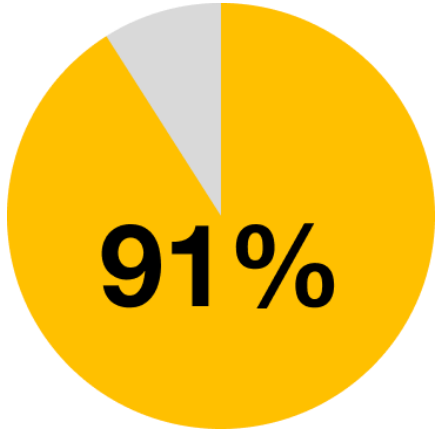
Honing Theory

Gabora (2016)

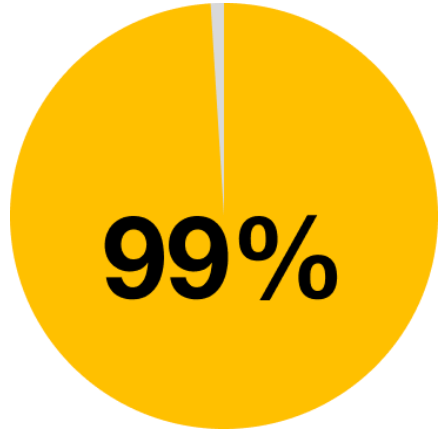
Creativity can be…

- Artistic
- Innovative
- Internal
- External
- Original / Novel
- Community – driven / inspired

Assessing Creativity?



Alternative Uses Test for Creativity
Haase & Hanel, 2023



Torrance Tests of Creative Thinking
Guzik, 2023

Comparing AI vs. Human creativity (3 Studies)

1. Assessing idea quality related to innovative business ideas
2. Crowdsource business ideas related to circular economy
3. Writing short stories (alone vs. using AI)

1

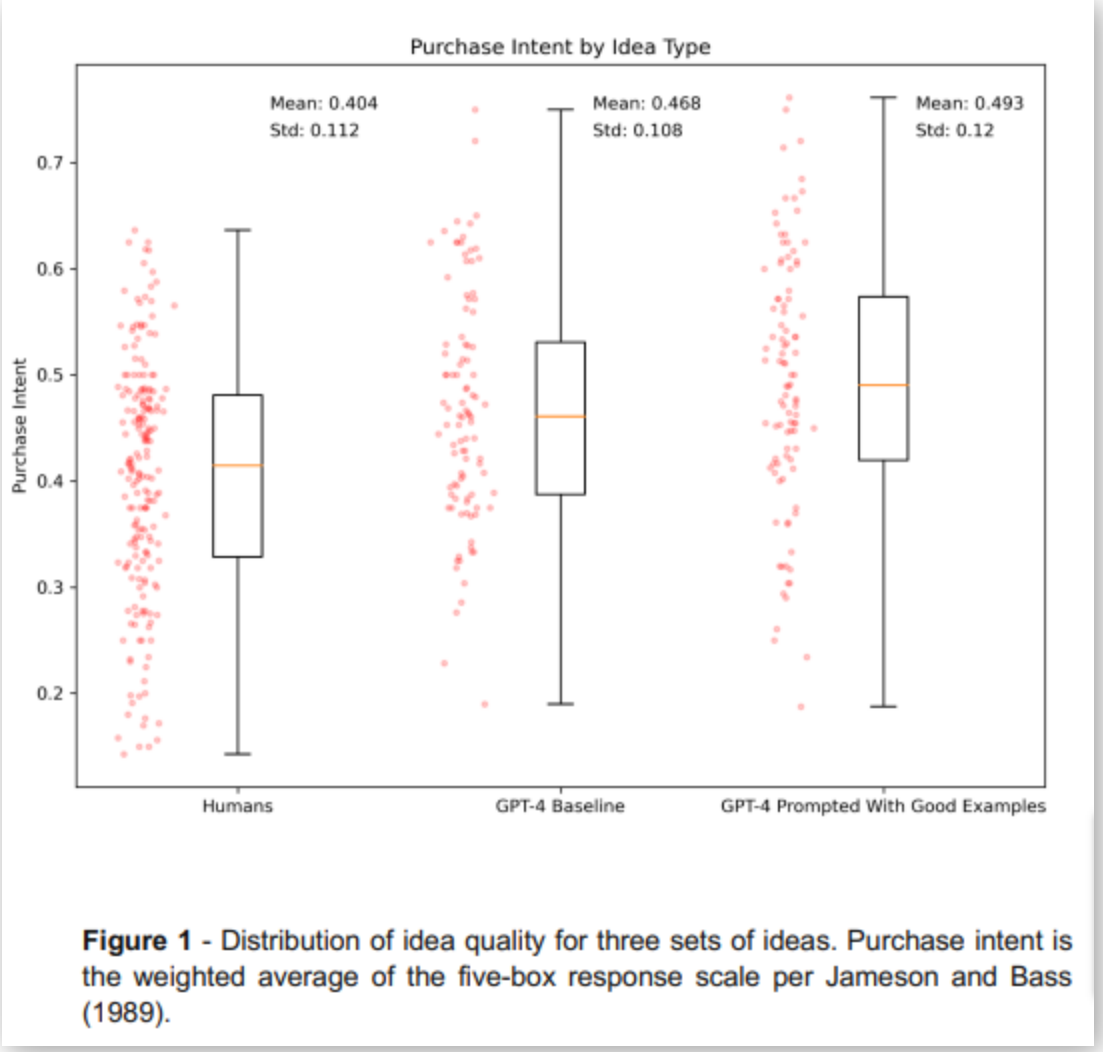
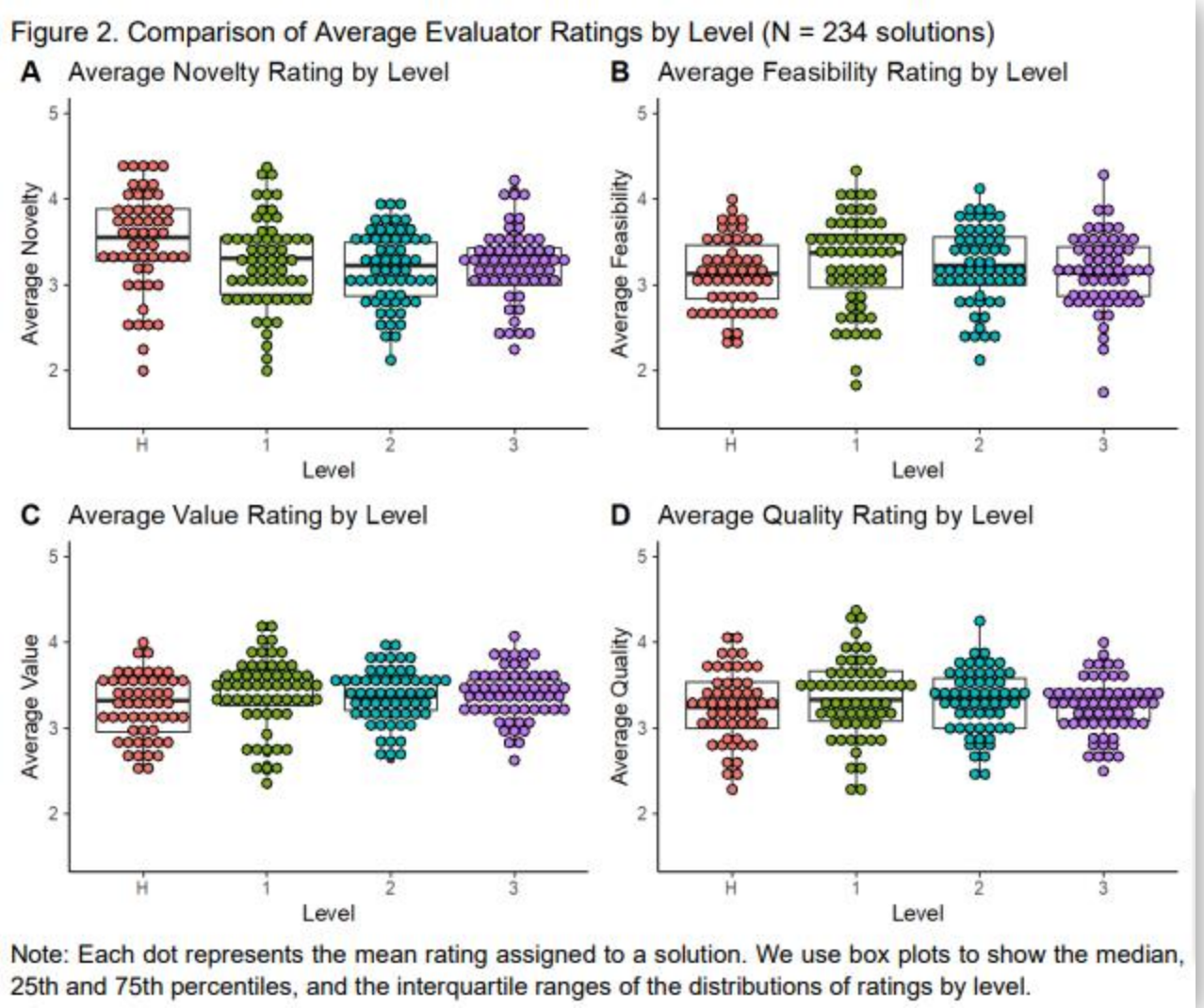


Figure 1 - Distribution of idea quality for three sets of ideas. Purchase intent is the weighted average of the five-box response scale per Jameson and Bass (1989).

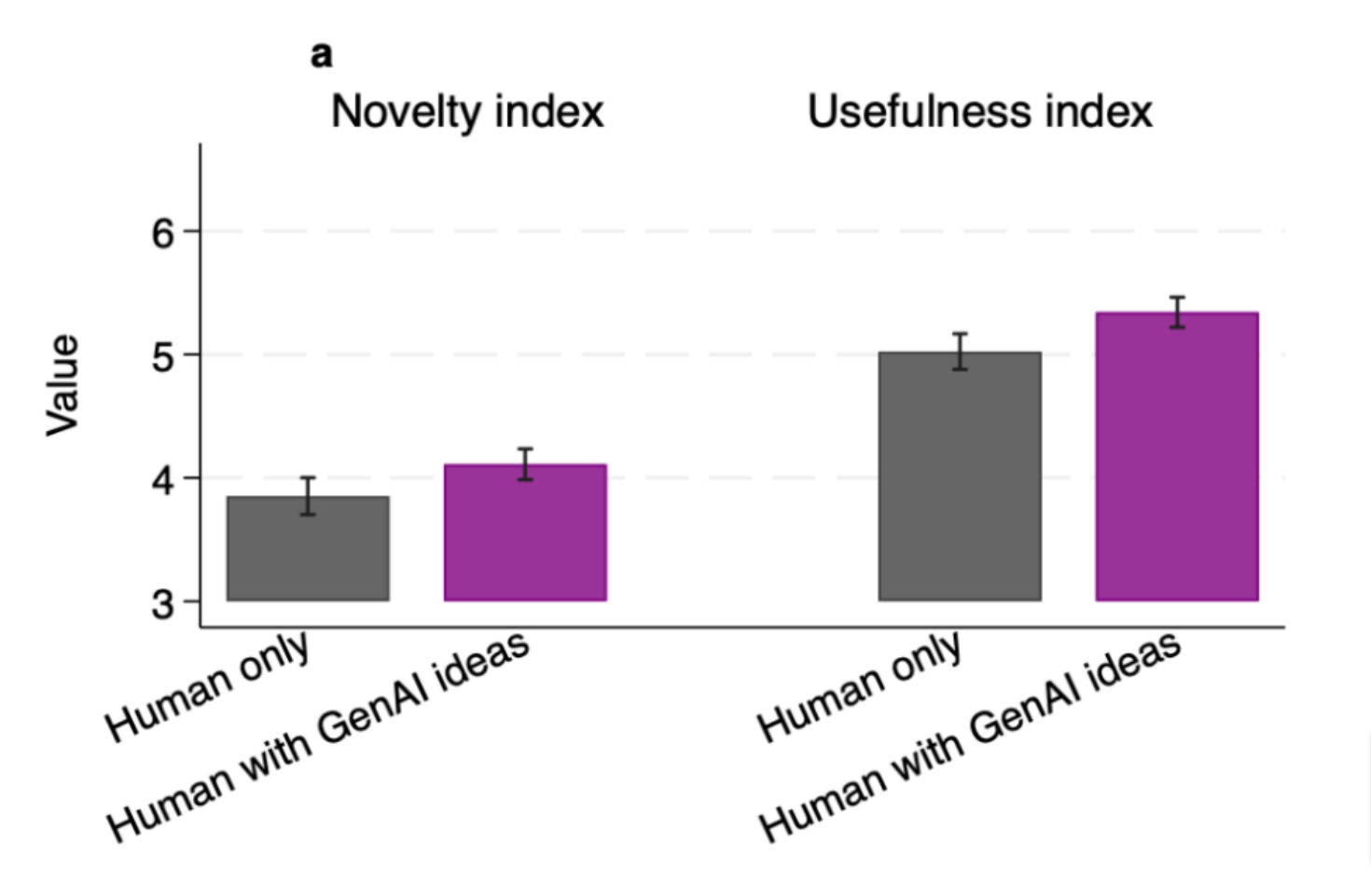
Girotra, Meincke, Terwiesch & Ulrich, 2023

2



Boussioux, Lane, Zhang, Jacimovic, & Lakhani, 2023

3

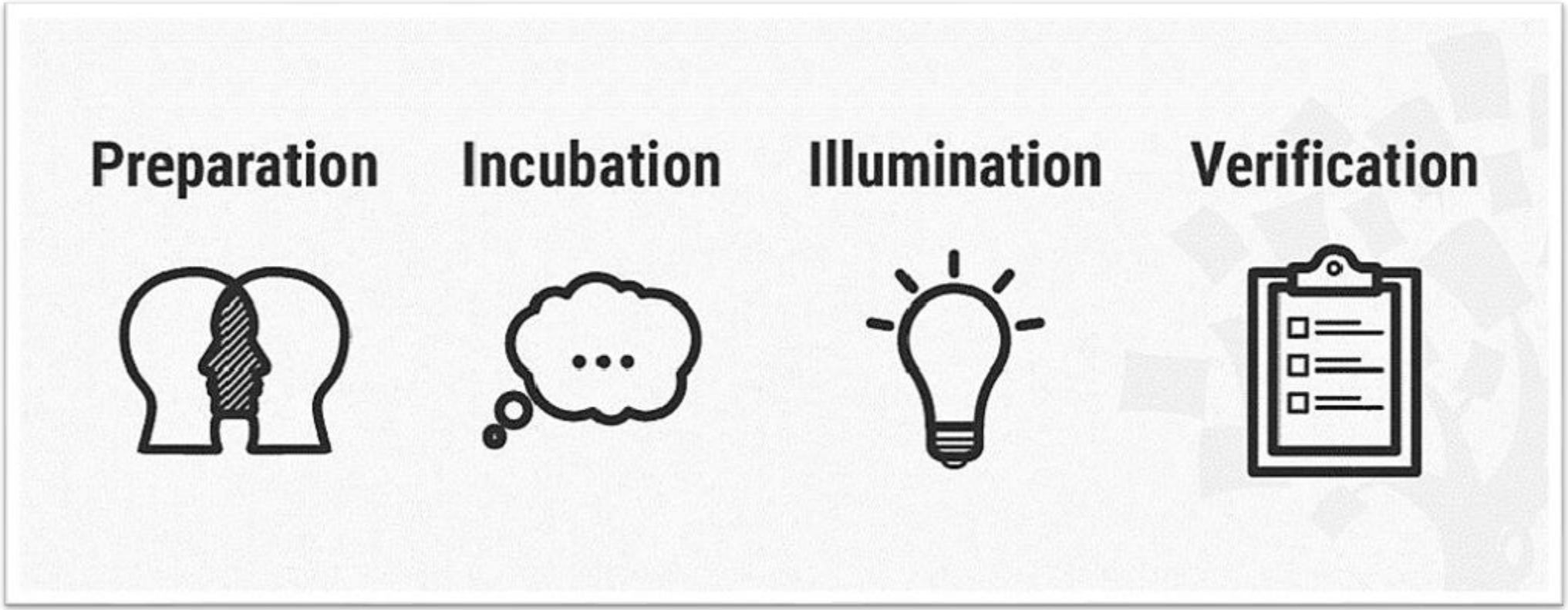


Doshi & Hauser, 2023

Takeaways from the 3 studies

- GenAI is very useful in real-life and practical idea generation and can help people generate better ideas
- GenAI tends to generate better ideas, except those who are exceptionally creative
- GenAI generated ideas have many underlying similarities with human generated ideas
- GenAI doesn’t represent the full creative process

The creative process

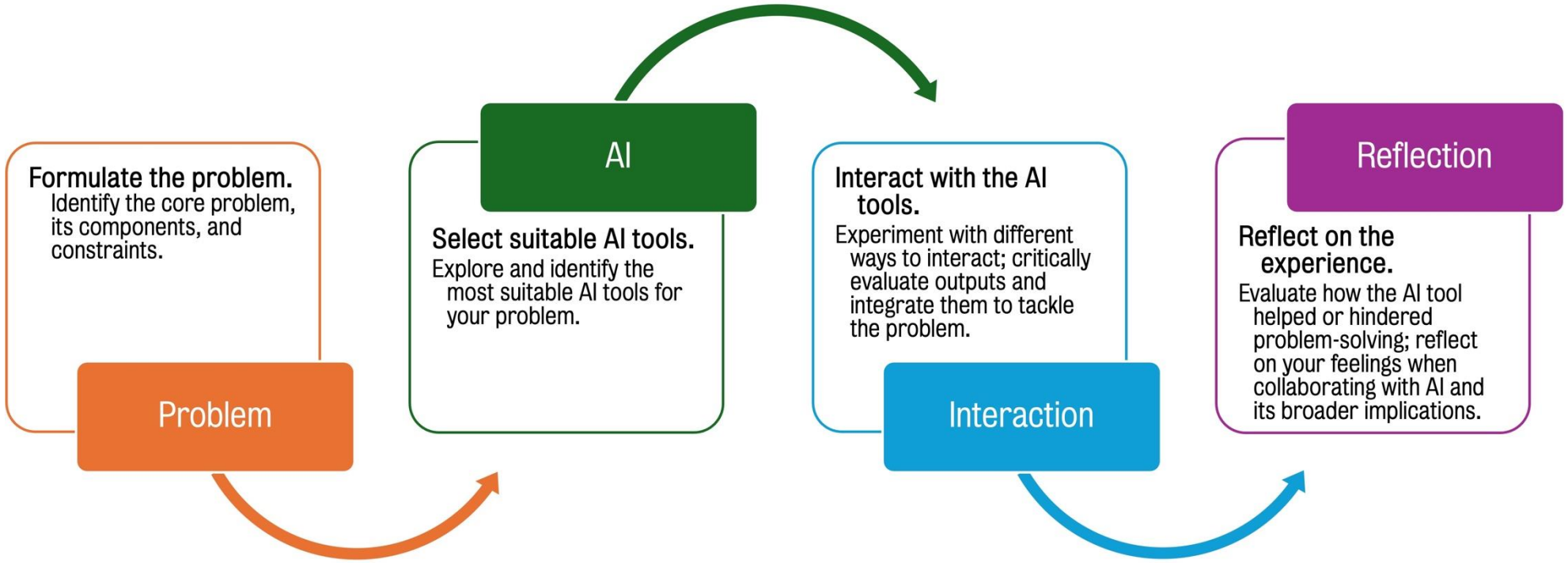


Wallas, 1926

Augmenting your creativity with GenAI

- Promote divergent thinking
- Help us work with a beginner's mindset
- Support idea evaluation and refinement

PAIR Framework



Wadas, 2026

Shared Doc Activity

- Individually reflect on and list out ways in which generative AI could help augment creativity or creative thinking
- https://uoft.me/jan30worksheet

Critical Thinking and Generative AI

What is Critical Thinking?

- **“Critical”**: The skillful examination and evaluation of information – emphasizing skepticism, objectivity, and analytical reasoning (Murawski, 2014)
- **“Thinking”**: The cognitive processes involved in mental activity, such as perception, reasoning, and problem-solving (Ruggiero, 2012)
- **Overall Characteristics**: The systematic analysis of information; the consideration of multiple perspectives; the application of logical reasoning to make informed judgments and sound decisions

Resource: Yusuf et al., 2024

Critical Thinking as Cross-Disciplinary

Generalists

- Critical thinking can be distilled down to a finite set of constitutive skills
- Can be learned in a systematic way and have applicability across all academic disciplines

Specificists

- Critical thinking as always contextual and intimately tied to the subject matter with which one is concerned
- It cannot be learned in a similar way across all disciplines

A Middle Way Approach

- Teaching critical thinking skills is discipline-specific and explicit
- There is significant overlap in the critical thinking processes across different fields

Resource: Schlueter, 2016

The R.E.D. Model to Critical Thinking

Recognize Assumptions

- Comprehensively understand the information presented
- Identify underlying assumptions
- Evaluate whether sufficient evidence supports the claims

Evaluate Arguments

- Analyze the information, examining the strength and validity of arguments and propositions
- Be aware of one's biases and look at the information through different perspectives

Draw Conclusions

- Synthesize the information from the previous stages to form a conclusion
- Based on the assumptions and evaluated arguments, determine whether to accept, reject, or propose alternative interpretations

Resource: Khanaifsawy, 2023

Chatterfall Activity

Step 1: Share your thoughts in the chat, but do not hit enter!

- In your teaching, what is **one way** in which the emergence of generative AI has altered **how students engage in or demonstrate critical thinking skills?**

Step 2: After about 1 minute, we will announce when you can enter.

Potential Benefits for Critical Thinking

Simplify Intrinsic Load

- Scaffolded, step-by-step guidance for problem-solving and analysis (Evmenova et al., 2024)
- Provide adaptive feedback based on fluency level

Reduce Extrinsic Load

- Break down complex tasks into manageable steps (ie. Goblin.Tools' Magic ToDo)
- Guide executive functioning (Tankelevitch et al., 2024)

Build Connections

- Explore different angles of a concept (Atchley et al., 2024)
  Supports non-linear learning: iterative transitioning between different cognitive levels (Gonsalves, 2024)

Potential Risks for Critical Thinking

Overreliance

- Easy access to AI content may hinder the development of independent analytical skills (McAlister et al., 2023)
- Increased cognitive offloading may reduce engagement with diverse sources

Superficial Learning

- It's black-box nature can obscure critical thinking
- Learners may not evaluate bias nor validate sources (Bearman & Ajjawi, 2023)
- May bypass thorough research and information synthesis

Cognitive Decline

- Prolonged AI overreliance may lead to a decrease in decision-making
- Decline in reflective problem-solving skills as AI handles complex tasks
- Decreased ability to critically evaluate information (Jackson, 2025)

Option 1: Critically Think About GenAI

Front-end AI

- AI technology used openly, often as the face of a product or service
- Can mimic human behavior and generate misleading content
- **Example**: Customer service chatbots

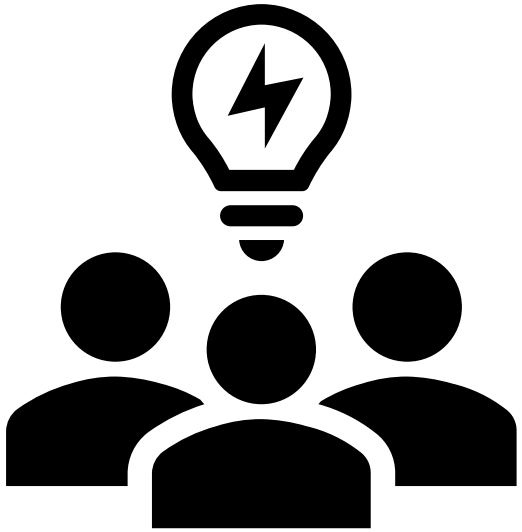
Back-end AI

- The underlying systems and technologies that support the front end, including algorithms and servers
- **Example**: Generating disinformation without disclosing origin

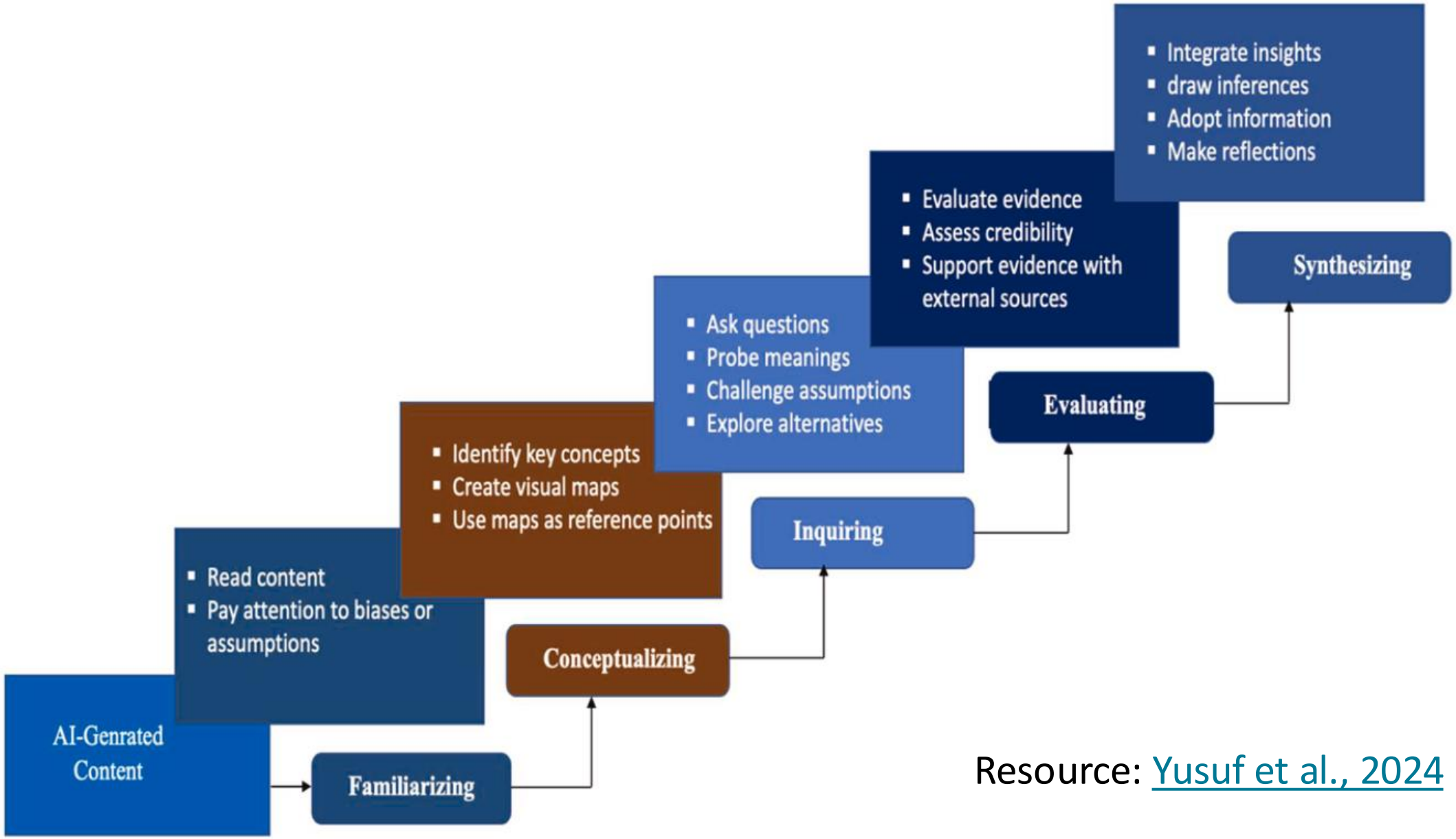
- **Critical AI Literacy**: Whether or not we engage with AI tools, it is crucial to critically evaluate AI-mediated communication (Giustini, 2024)
- **Example Activity**: What is AI-generated misinformation? (Stanford)

Option 2: Critically Think With GenAI

- Critical thinking in AI-mediated learning challenges Bloom's Taxonomy's linear structure – and requires AI-specific competencies (Gonsalves, 2024):
  1. **Melioration**: Select and combine AI tools and information to solve complex problems, leading to adaptive learning
  2. **Ethical Reasoning**: Consider ethical implications of AI use in decision-making
  3. **Collaboration**: Work effectively with AI and human peers
  4. **Reflective Thinking**: Engage in metacognitive processes to improve AI interactions



Framework for Critically Thinking with AI-Texts



Resource: [Yusuf et al., 2024]

Proposed AI-Adjusted Additions to Bloom's Taxonomy

Bloom's Taxonomy	AI-Adjusted Level (Addition)	Description
Knowledge	Familiarizing	Understanding and identifying biases in AI-generated content
Understanding	Conceptualizing	Creating a cohesive understanding by integrating AI and human insights
Application	Inquiring	Engaging in questioning and exploring with AI assistance
Analysis	Evaluating	Comparing, organizing, and critically assessing AI-generated information
Evaluate	Synthesizing	Synthesizing key concepts and ideas from AI outputs
Create	N/A	N/A

Resource: Yusuf et al., 2024

Individual Activity: Critical Thinking and AI

- On Activity #2 of our shared document, individually reflect on one or more:
    1. **Critical thinking with GenAI**: What is one way to integrate GenAI into learning activities to support students' disciplinary critical thinking skills?
    2. **Critical thinking about GenAI**: What is one way to help students develop critical AI literacy skills relevant to their disciplines?
    3. **GenAI as a thought partner**: What is one way that you can use GenAI to support your own critical thinking?
- Access the shared document: https://uoft.me/jan30worksheet

You will have 5 minutes for this activity.

Critical Thinking Activities with GenAI

Recognize Assumptions: Red-Teaming Activities

- Simulate adversarial scenarios with AI to critically evaluate its outputs and address its ethical issues
- Encourage skepticism and constructive critique of AI-generated content

Evaluate Arguments: Critique and Improve

- Iteratively refine AI-generated content to meet specific criteria
- Compare AI results with authoritative sources to identify gaps and inaccuracies

Draw Conclusions: Metacognitive Reflection

- Evaluate how AI usage impacts their problem-solving strategies over time
- Reflect on ethical considerations and potential biases in AI-assisted decision-making

Mitigating Risks of Integrating AI into Teaching

Chatterfall Activity

Step 1: Share your thoughts in the chat, but do not hit enter!

- When should we **avoid** integrating generative AI into our work with students and our teaching planning?

Step 2: After about 1 minute, we will announce when you can enter.

Promoting Responsible GenAI Use

Instructor-led interventions can promote students' abilities to:

1. **Conceptualize:** Understand and identify opportunities for AI integration in problem-solving and creative tasks
2. **Apply to new learning environments:** Practice using AI tools to enhance critical thinking and creative processes

However, integrating generative AI requires careful consideration:

- We want it to support – not replace –learners' engagement in the cognitive steps that lead to disciplinary understanding, knowledge creation, and creative thinking

Considering Next Steps

1. To what extent do I want to build AI literacy in my students, while also helping them complete assessments?
2. How can I guide students to use AI tools ethically as learning aids, encouraging honesty and personal responsibility in their academic work?

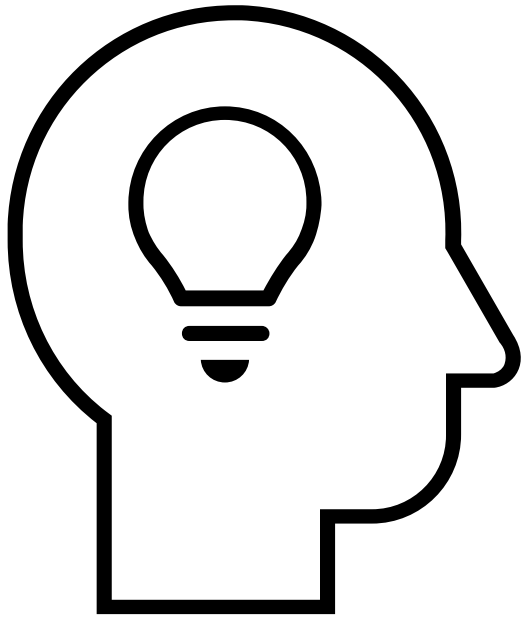
"The solution will have to involve […] **incentivizing cognitive engagement** in ways that help students learn to use AI as problem-solving tools."

- Waltzer et al., 2024

Reflection Activity: What will you try?

Today's Focus:

- To explores ways to engage with AI tools in and beyond teaching to support, rather than replace, creative and critical thinking



Share your thoughts:

- What will you try?
- What reflections or questions do you have?

Additional U of T Resources

Instructor-Facing Resources:

- Centre for Teaching Support and Innovation - Teaching with GenAI: Considerations for Teaching Assistants
- Office of the Vice-Provost, Innovations in Undergraduate Education – Generative Artificial Intelligence in the Classroom FAQ's
- See more at CTSI's Institutional Guidance page!

Student-Facing Resources:

- Mississauga (UTM), Robert Gillespie Academic Skills Centre: Generative AI Guide for Students.
- Scarborough (UTSC), Centre for Teaching and Learning: GenAI at UTSC, including a Using GenAI: Students resource.
- St. George, Centre for Learning Strategy Support (CLSS): Appointments & Workshops

Upcoming CTSI Programming

Date	Time	Session
February 3	1:30 pm to 2 pm	UDL Conversation with Cheryl Lepard
February 5	2 pm to 3 pm	GenAI Works in Progress: Embracing Experimentation with GenAI
February 11	2 pm to 3 pm	Generative AI Virtual Drop In - Getting Started with Microsoft Copilot

CFP (proposals due February 7)

U of T's Teaching and Learning Symposium: Teaching and Learning for Human Flourishing (May 12 and 13)

Q&A

Thank you!