From Teacher Education to Classroom Practice: Ethical and Responsible Use of Generative AI

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ChatGPT's illustration for the research (Oct, 2024)
Illustration generated by OpenAI's DALL-E, based on iterative prompts crafted by Phuong Bui (powered by GPT-4).

ChatGPT Self-portrait (Oct, 2024)

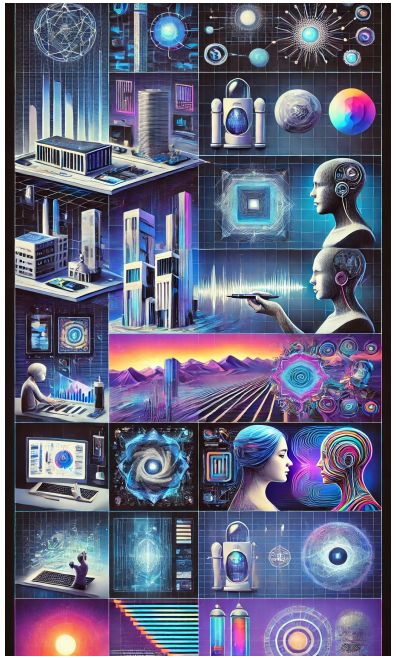
Self-portrait generated by OpenAI's DALL-E, based on a descriptive prompt crafted by ChatGPT (powered by GPT-4).

Outline

- Introduction
  - Questions
- Gen AI Readiness
- Implications and challenges
- Discussions
  - Tools and resources

Quick introduction about GenAI

- Generative artificial intelligence (GenAI) is AI technology that capable of **generating novel content** (*texts, images, videos, audios, codes, etc*) – in response to **prompts expressed in natural language**. (*IBM, 2024*).
- Foundational models, such as Large Language Models (LLMs) which can be fine-tuned to handle diverse tasks, **even if they are not explicitly trained** for them (*Bommasani et al., 2021*).
- LLMs learns patterns in language - including the way math problems are written and solved.
- It doesn't "think" or "understand" .Instead, it **predicts** the most likely next words based on patterns.



ChatGPT illustrated GenAI (Nov, 2024)
Illustration generated by OpenAI's DALL-E, based on a descriptive prompt crafted by Phuong Bui (powered by GPT-4).

Basic mechanism of Large Language Models

How does a LLM solve a math problem?

- **Tokenizes** the input: It breaks the sentence into chunks it recognizes.

$$Solve: 2x + 3 = 7$$

- **Searches its internal patterns**: based on training, it's seen *many* examples of similar problems and their solutions.

- It then **predicts (probabilistic) the next best response**, based on examples it has seen during training.

- So, it is **NOT** actual reasoning.

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GenAI characteristics

Limitations	Nature	Capabilities
Lack of focus and depth	Protean	Handling diverse tasks across multimodels without specific training
Blackbox nature, lack of transparency and interpretability	Opaque	Complexity reduction for effortless use
Risks of hallucinations	Unstable	Producing fast, flexible outputs even with minimal input
Generating patterns,not verified truths	Generative	Synthesizing and recombining information in creative ways.
Illusion of understanding without real comprehension	Social	Engageing in dialogue and models collaborative interaction.

Gen AI Readiness

- Rapid advancement in the fields since the public release of ChatGPT-3.5 in November 2022.
- ”AI boom”, ”AI spring”, “ChatGPT-era”, etc.
- European Commission (2022) proposed that one of the core components in successfully integrating and harnessing AI systems in education is to increase educators’ and teachers’ AI competencies.

➢ How can we effectively prepare educators to engage with GenAI in educational settings?

Questions

(1) Will AI integration meaningfully advance educational goals, or will it produce or intensify potential harms instead?

(2) If we agree that part of our ethical responsibility is to help students develop their own thinking and learning capacities, in what specific situations (if any) do you think it is unethical for a teacher to rely on GenAI - even if it would save time or improve the apparent quality of materials?

GenAI Readiness Scale (Bui et al., 2025)

ANX_2_I feel anxious about keeping up with the rapid development of GenAI.

ACCU_3_I am uncertain about the consistency and reliability of content generated by GenAI tools for educational purposes.

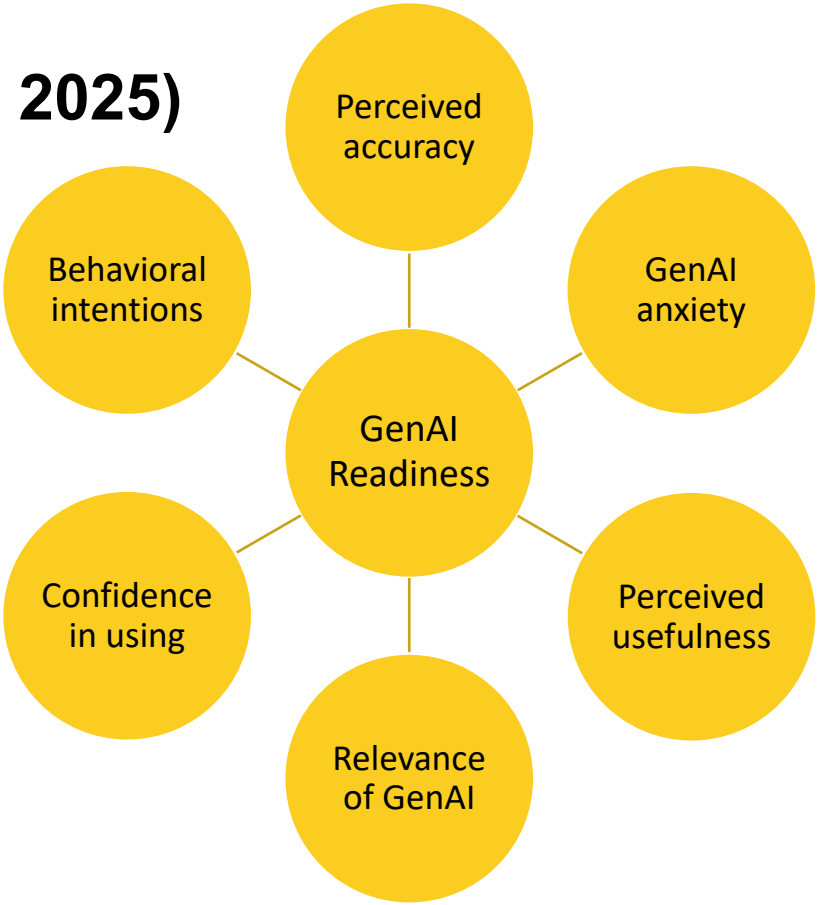
USE_4_I think that GenAI technologies like ChatGPT can provide me with personalized and immediate feedback and suggestions for my tasks.

CONFI_3_I am confident that I can support students' learning of GenAI in my lessons.

BEHA_1_I plan to incorporate GenAI technologies into my learning and teaching practices in the future.

RELE_1_ Studying GenAI will benefit my future teaching career.

REDI_1_I feel prepared to deal with the potential risks of GenAI tools, such as misinformation or biases.



Research design:

T1 Pilot data collection (N=77) (Bui et al., 2025)

- Included for Gen AI readiness analysis: n= 56
- Excluded (no prior use): n= 21

QUANTITATIVE

- Participants' background
- Gen AI Readiness survey
- Gen AI usage

QUALITATIVE

- 3 open-ended items (use experiences, challenges, coping).

April - June 2024

T2 Sequential data collection (N=124)

- Included for Gen AI readiness analysis: n= 114
- Excluded (no prior use): n=10

QUANTITATIVE

- Participants' background
- Gen AI Readiness survey
- Gen AI usage

QUALITATIVE

- 3 open-ended items (use experiences, challenges, coping + future intention).

Oct 2024 - March 2025

Research questions

(1) What patterns emerge in Finnish pre-service teachers' GenAI readiness and usage behaviors?

(T1+T2 total pool of participants N=170)

(2) How do Finnish PSTs describe their GenAI-related types of tasks, experiences, challenges, coping strategies, and support needs in T2 data collection ?

(Emerging data from T1 + T2)

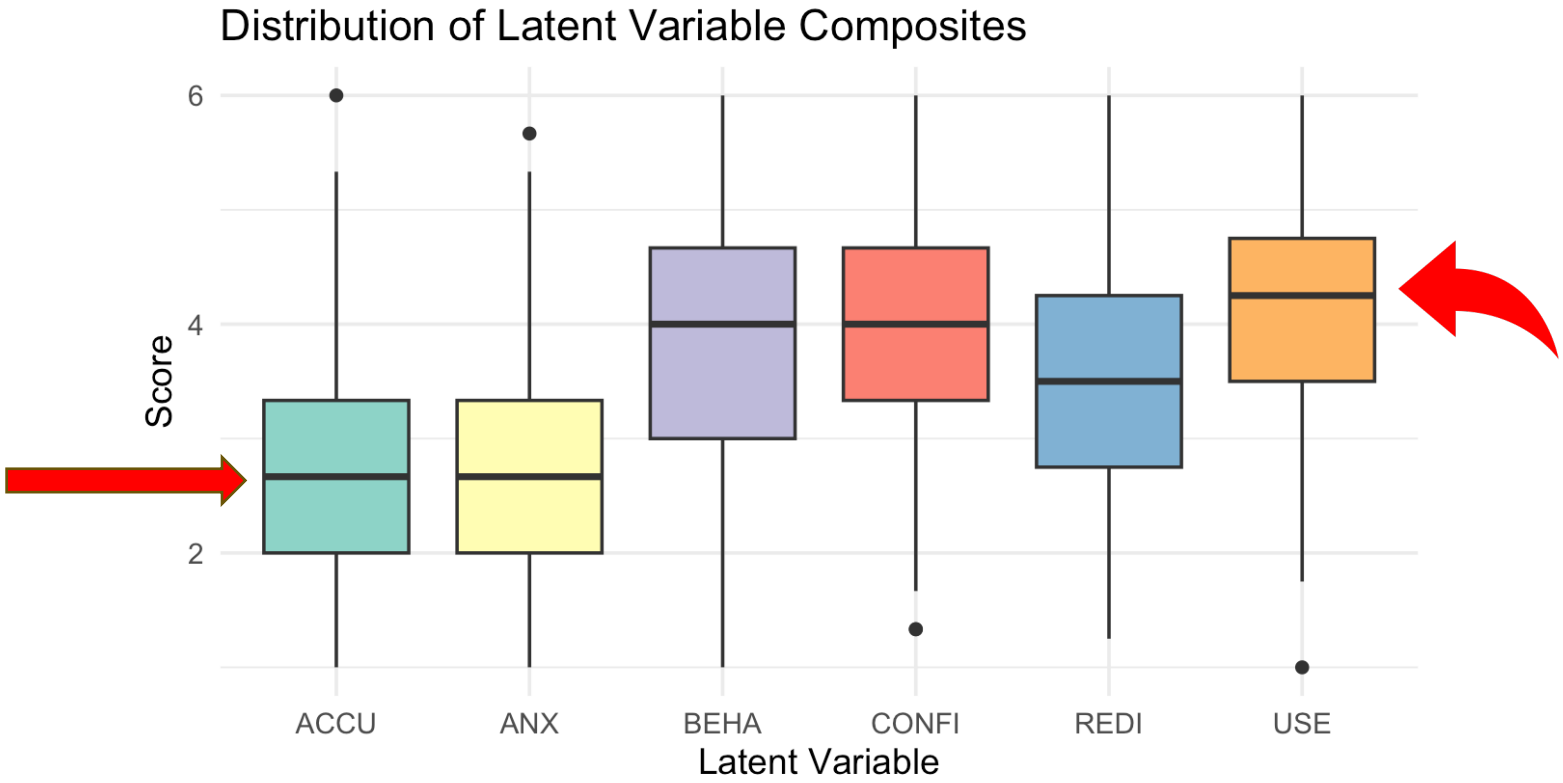
Results

N= 170

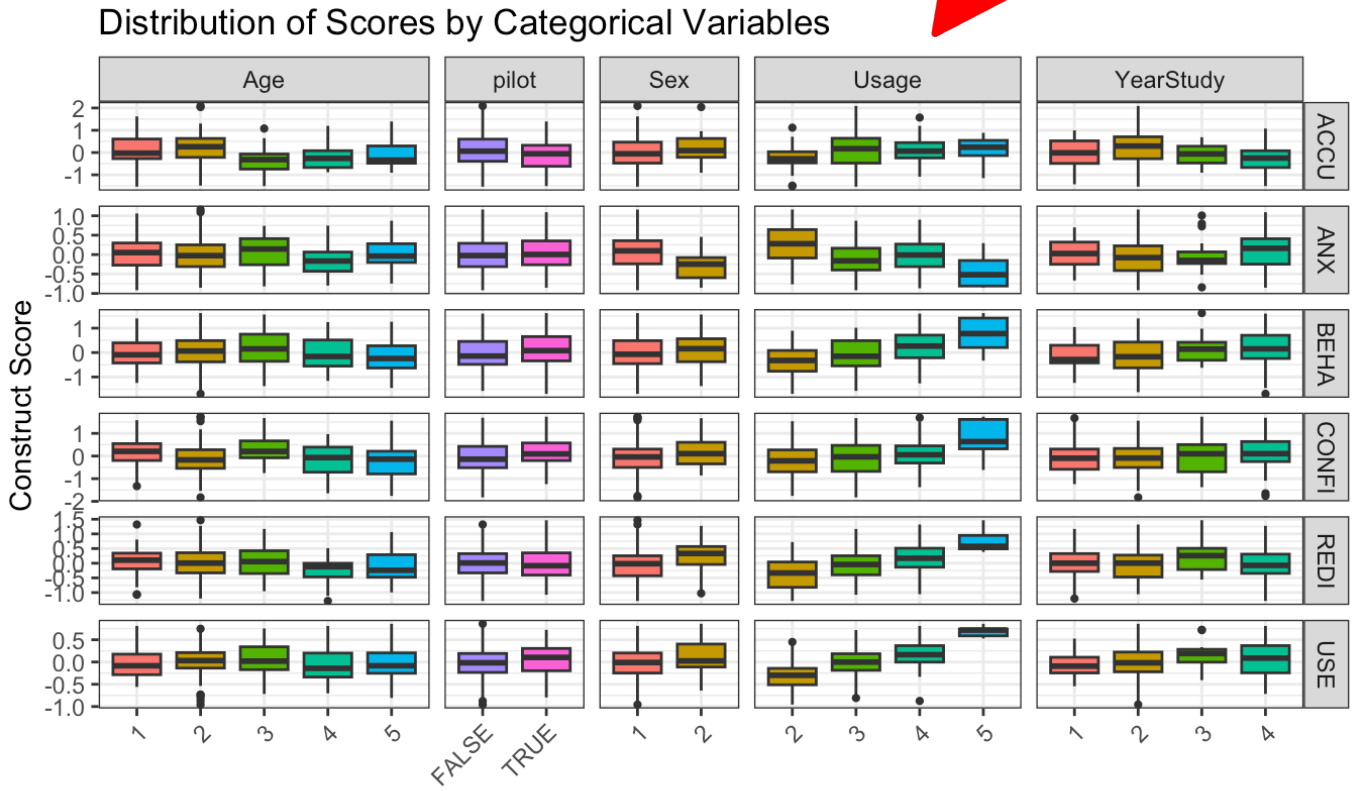
(T1+T2)

		Pilot study (%)	Main study (%)
Sex	Female	72.73	79.82
	Male	21.82	16.67
	Others	0.00	3.51
	Not disclose	5.45	0.00
Age	17-20	7.14	24.56
	21-24	50	39.47
	25-28	25	11.4
	29-32	10.71	7.89
	33+	7.14	16.67
Year of study	1	10.71	14.91
	2	16.07	59.65
	3	23.21	6.14
	4	50	18.42
	5	0.00	0.88
GenAI Usage frequency	Rarely	21.43	22.81
	Sometimes	37.50	41.23
	Often	35.71	31.58
	Always	5.36	4.39

Level of readiness & behavioral intentions



Patterns in GenAI readiness and usage



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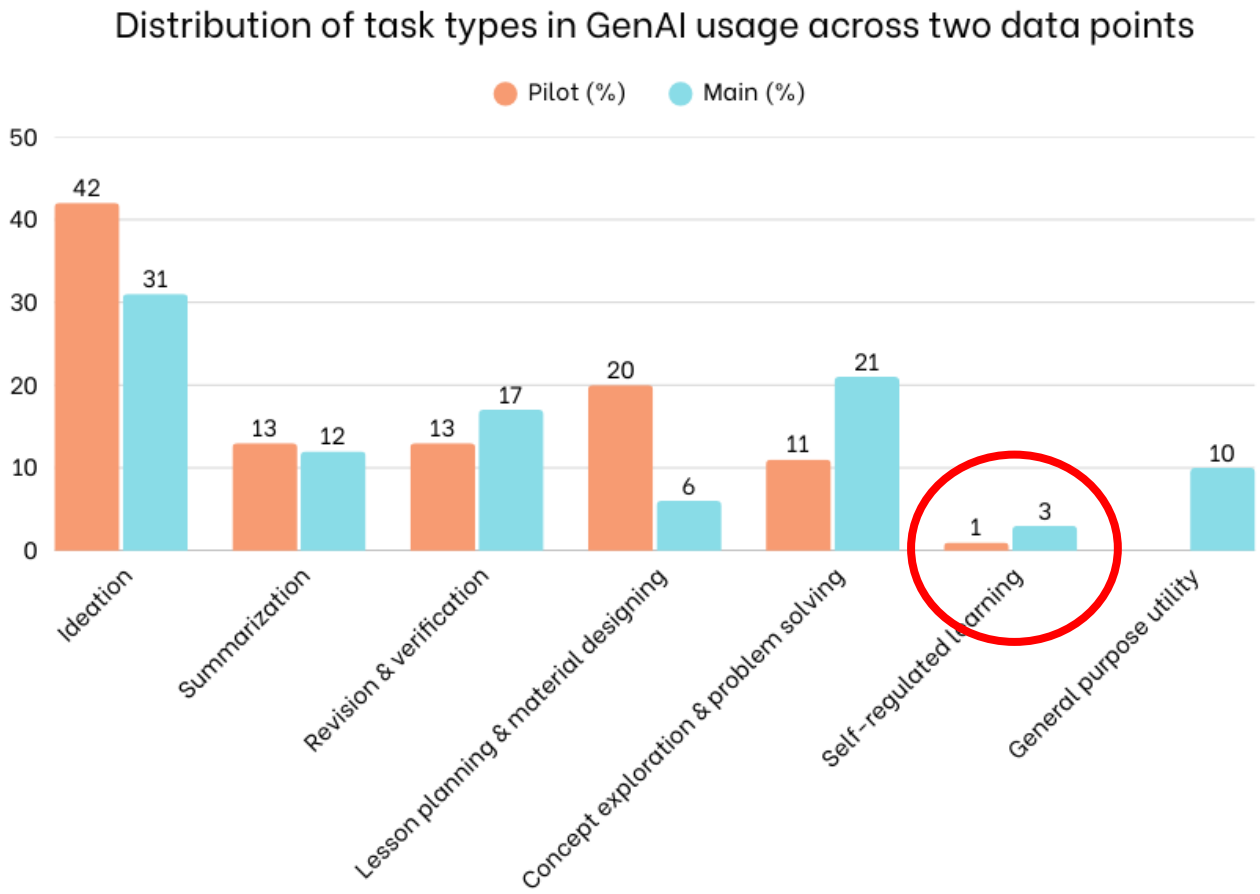

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Patterns in GenAI usage

Operational fluency ≠ regulatory competence: PSTs learned *how* to use GenAI but not *when/why* to use it strategically/ deeply for learning

- T1 (baseline): 1.5%
- T2 (6 months later): 3%

Task performance dominated: GenAI used for content generation, not metacognitive support

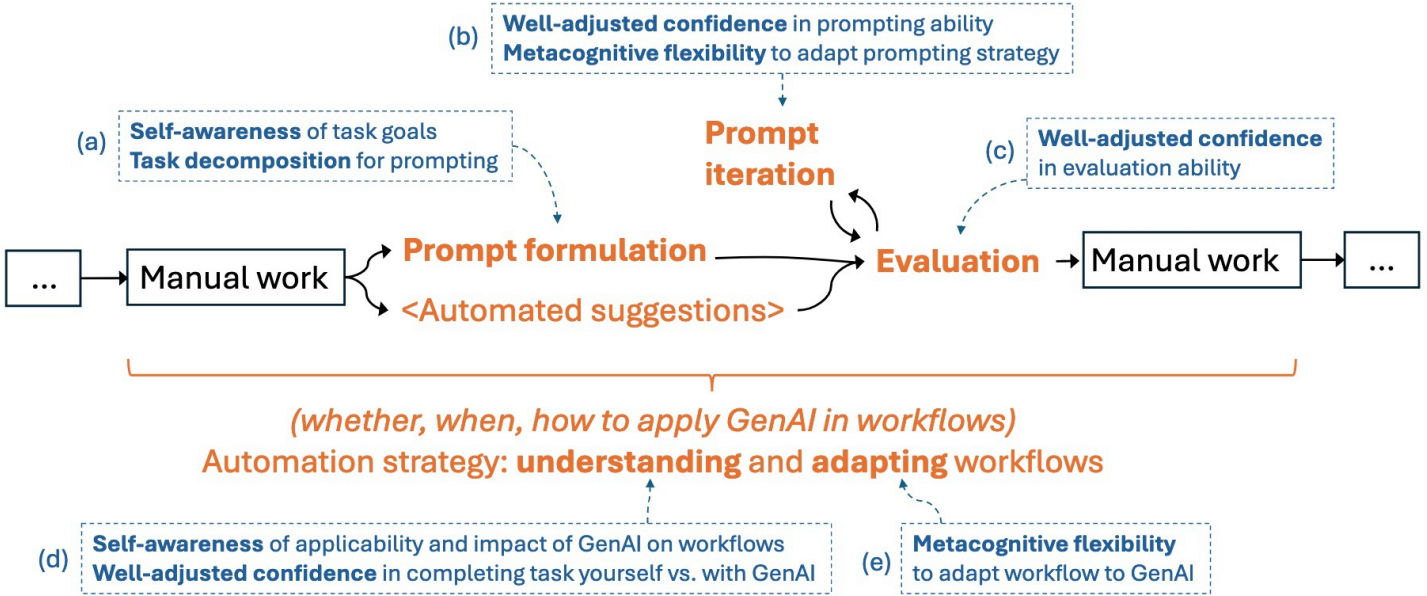
Explicit scaffolding required: Exposure alone won't develop self-regulated GenAI

Main challenges and coping strategies

- Prompt related challenges
- AI - evaluated outputs
- (Lack of) competence (e.g. AI literacy, English)
- Accessibility (e.g. paid services)

  - Ethical & responsible use

Metacognitive demands of GenAI



(Tankelevitch, L., Kewenig, V., Simkute, A., Scott, A. E., Sarkar, A., Sellen, A., & Rintel, S. (2024, May). The metacognitive demands and opportunities of generative AI. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems* pp. 1-24)

Prompt good-to-know

- Understanding your own task goal(s). What are you trying to achieve?
- Prompting means writing a very clear description of a task and / or compiling instructions.
- Prompting well is different with writing well.
- As you need to iterate constantly, checking what is misinterpreted, what is unclear, etc. is important.
- Be aware of your own tacit knowledge.
- There is always a better prompt (trade off latency).
- Different prompt strategies work with different outputs (e.g. multi-shot prompts texts vs image).
- Context-window: the amount of information an AI consider at one time (i.e. not everything)

Where are we and what else do we need?

- **Prompt design and formulation**: goal setting, task decomposition, etc.
- **Output evaluation:** Evaluating GenAI's output against your expertise (*accuracy, pedagogical appropriateness, relevance, etc.*)
- **Iterative prompt refinement**: Self-monitoring AI interaction (*e.g. time vs quality, trade-offs*)
- **Strategic AI integration**: when, how, for what kind of tasks (*your specific needs*)
- **Ethical awareness & responsible use:** bias, curriculum-mismatched, environmental factors, etc.

Questions

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References

1. Bui, P., Korhonen, T., Kontkanen, S., Karme, S., Piispa-Hakala, S., & Veermans, M. (2025). Exploring pre-service teachers' generative AI readiness and behavioral intentions. *LUMAT: International Journal on Math, Science and Technology Education*, *13*(1). https://doi.org/10.31129/LUMAT.13.1.2755
2. Bommasani, R. (2021). On the opportunities and risks of foundation models. *arXiv preprint arXiv:2108.07258*.
3. Tankelevitch, L., Kewenig, V., Simkute, A., Scott, A. E., Sarkar, A., Sellen, A., & Rintel, S. (2024, May). The metacognitive demands and opportunities of generative AI. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems* pp. 1-24
4. Some figures and data are from our upcoming paper.

Thank you ☺
Questions?
Collaboration?

AI in STEM / Math Ed, tech-adoption in Ed
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GenAI tools and resources

- **Chatbots:** ChatGPT, Claude, Gemini, Microsoft Copilot, Perplexity AI
- **Image generation:** DALL-E3, Google Nano Banana Pro (Gemini), Firefly
- **Chart & visualization:** Canva, Mermaid AI.
- AI Prompt Cookbook