

# *Artificial Intelligence in Education*



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*TIESA Key Education Expert*

*April 2024*



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# Agenda

*Intro*

*Background*

1. What is generative AI and how does it work
2. The benefits and potential of AI in Education
3. Examples of GenAI systems
4. Controversies around global, generative AI and their implications for Education
5. Implementing AI in Education

*Concluding remarks*



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# Introduction

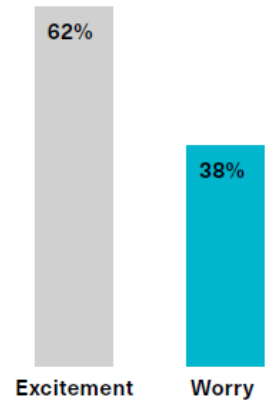
- AI in education
- Presentation applicable to K-12. Application to TVET, universities and research have not been included
- Both opportunities **and** challenges for educational systems
- Both AI's potential **and** limitations



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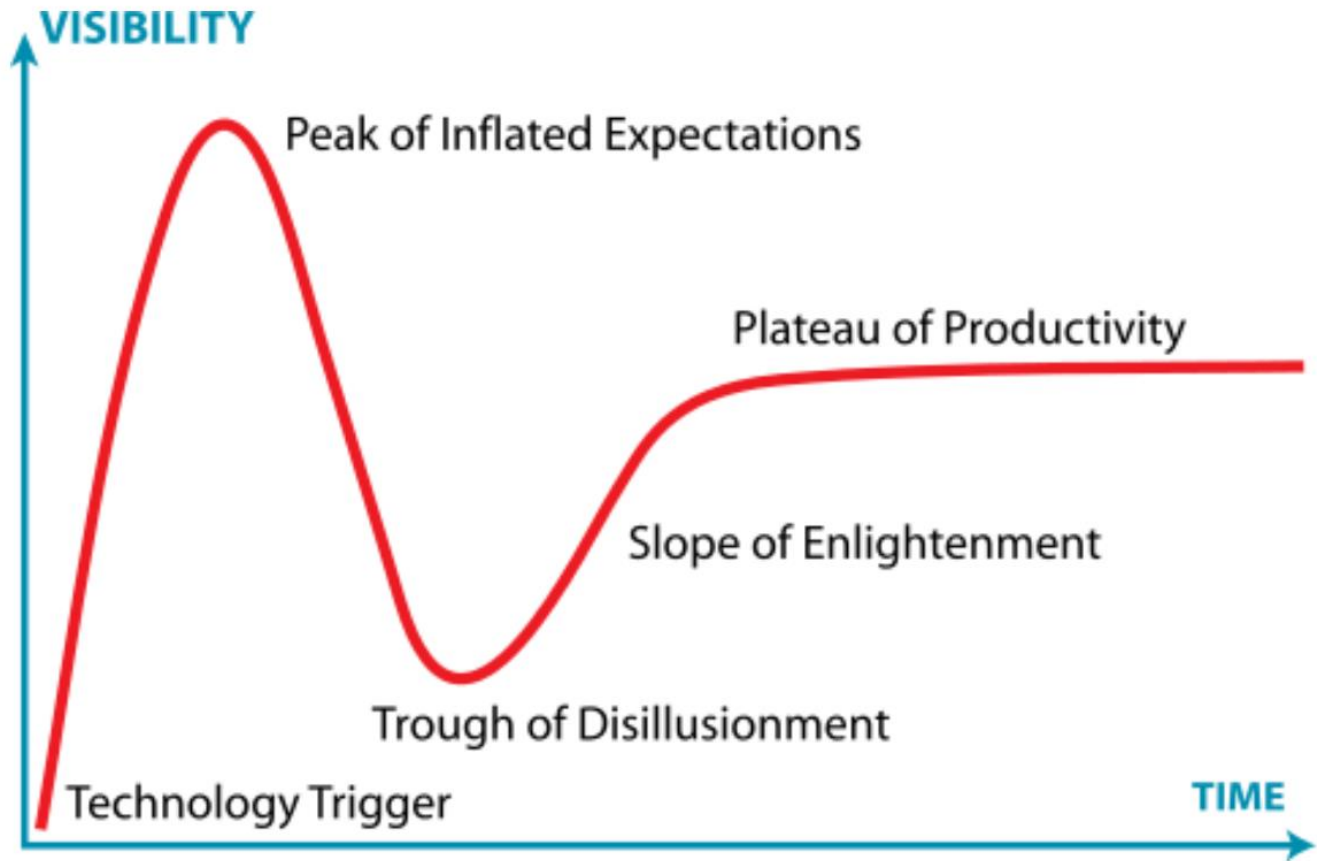


- Some countries in Asia already integrating AI-focused curricula for schools
- Explore sources for yourself - including
  - ❑ UNESCO (2023 Sept). Guidance for generative AI in education and research.
  - ❑ Asia-Europe Foundation (ASEF). Dr Wayne Holmes (Ed.). (2023). Asian & European Teachers' Perspectives on AI and Education -between April - May 2023; 330 responses (205 from Asia) from 43 Asian and European countries have been analysed
  - ❑ UNESCO (2023 Nov). Empowering minds: a round table on Generative AI and Education in Asia-Pacific
- ASEF survey: the 330 respondents were asked how excited and how worried they were about the application of AI in their teaching: before I reveal, in this room...



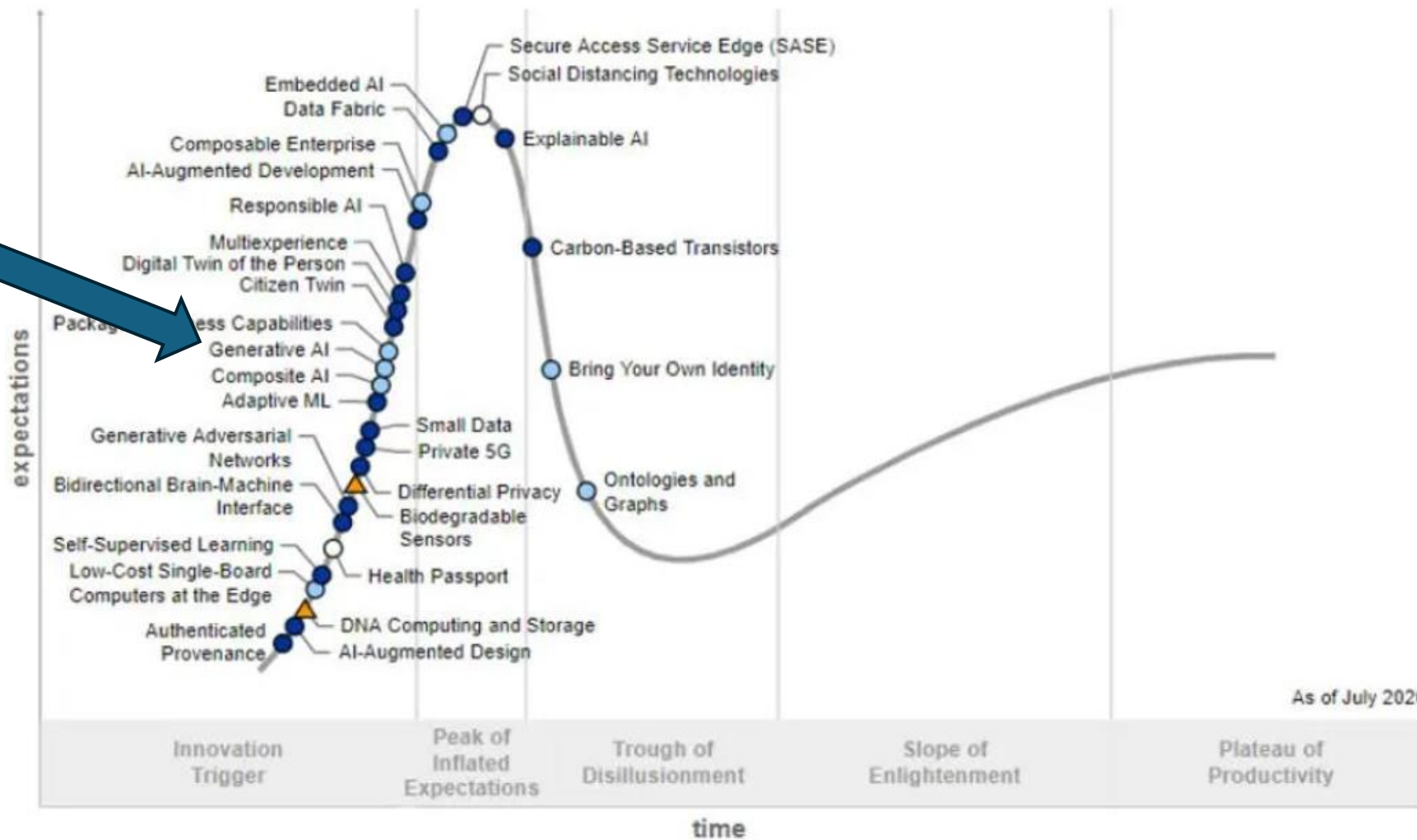
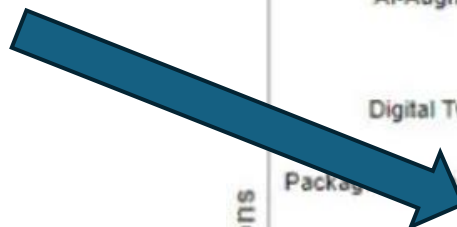
**How do you feel? Who are excited? Who are worried? Who are both?!**

## Gartner's Hype cycle of technologies

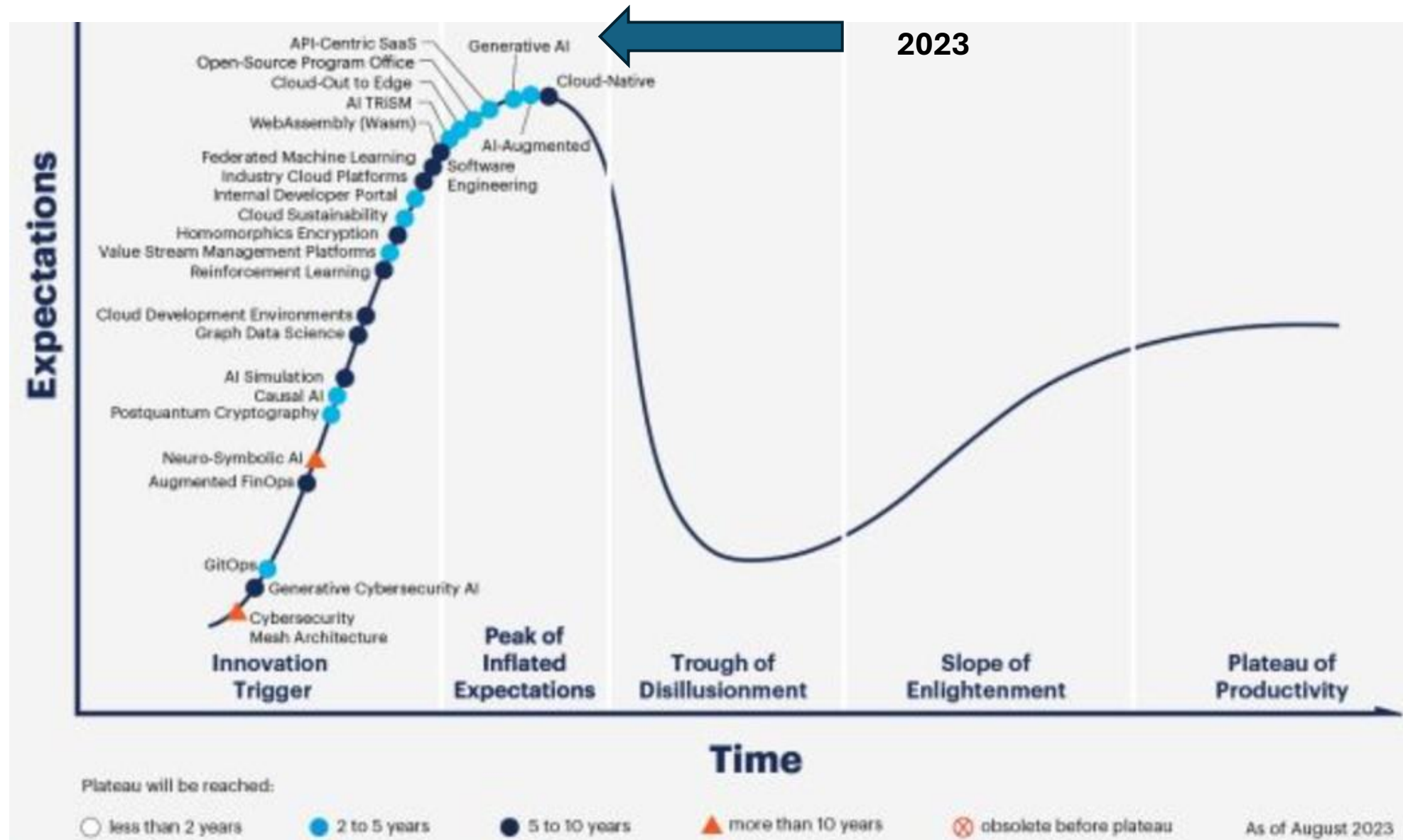


# Hype Cycle for Emerging Technologies, 2020

July 2020







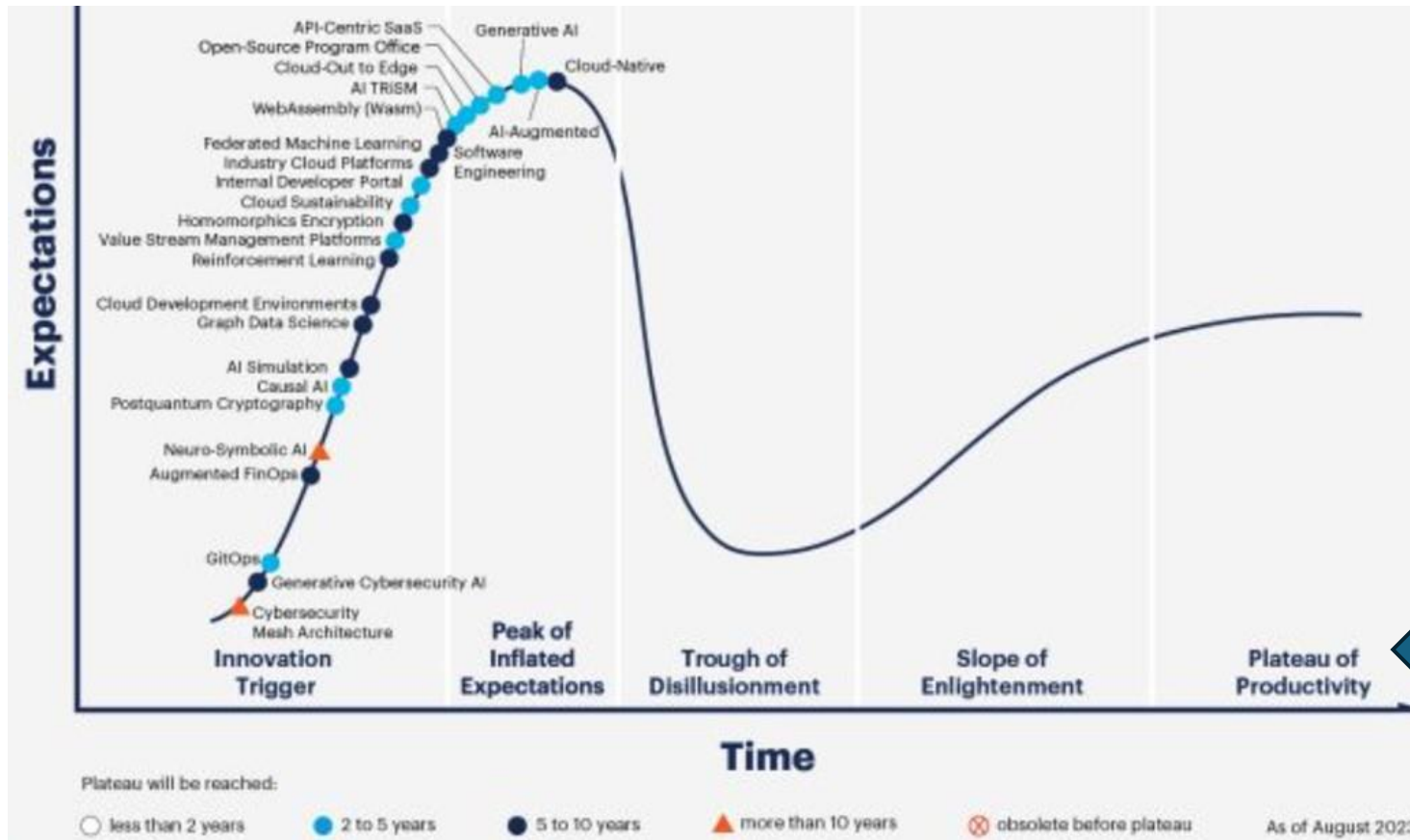
The mobile phone spread over the whole world, in less than two decades, with positive and negative implications...also Google maps!







Who thinks it will reach the plateau faster? Who thinks it will take longer?



← 2-5 years



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Learning Possibilities

# Background

- Generative artificial intelligence (GenAI) into public awareness in late 2022 when ChatGPT of OpenAI launched. – also chatbots and Siri
- AI has been used by researchers for 20 years while the AIED research community researching AIED for more than 40 years.
- Pre-Nov 2022, AI was often used in language learning and mathematics
- AI a field within computer science aimed at developing machines capable of tasks typically requiring human intelligence - computer scientist John McCarthy coined “AI” in 1956!



Many alternatives to ChatGPT, like:

- Alpaca: aims to address Large language models (LLM)' false information, social stereotypes and toxic language
- Bard
- Chatsonic
- Ernie (also known as Wenxin Yiyan 文心一言)
- Hugging Chat
- Jasper
- Llama
- Open Assistant
- Tongyi Qianwen (通义千问) LLM from Alibaba that can respond to prompts in English or Chinese.
- YouChat



Most of these are free to use (within certain limits), while some are open-source.



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Many other products are being launched that are based on Large language models (LLMs).

E.g.

- ChatPDF: Summarizes and answers questions about submitted PDF documents.
- Elicit: The AI Research Assistant: Aims to automate parts of researchers' workflows, identifying relevant papers and summarizing key information.
- Perplexity

LLM-based tools are being embedded into other products, such as web browsers. E.g. extensions for Chrome built on ChatGPT include WebChatGPT; Compose AI; TeamSmart AI; Wiseone



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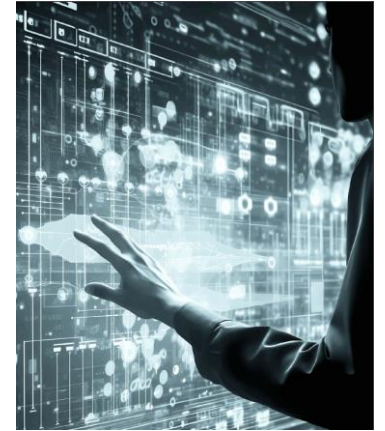
Examples of image GenAI models that generate images from text prompts (most are free): Craiyon; E mini; DALL; DreamStudio; Fotor; Midjourney; NightCafe; Photosonic

Examples of video GenAI include Elai; Glicloud; Pictory; Runway.

Examples of music GenAI include Aiva; Boomy; Soundraw; Voicemod

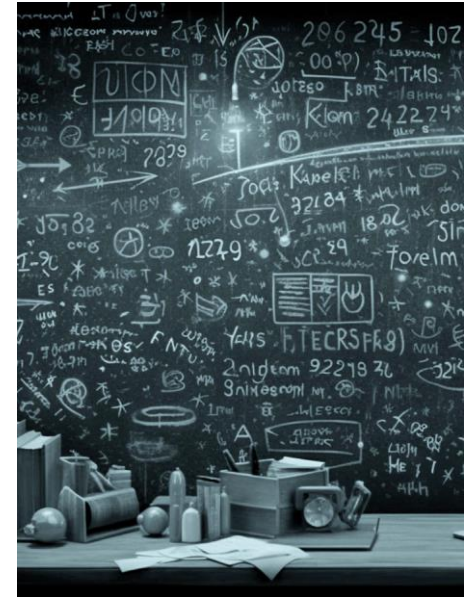
GenAI can also generate computer code

AI in education (AIED) tools to support teachers and students with vetted sources and in a controlled environment e.g.ELSA



# 1. What is generative AI and how does it work

- Traditional AI (Narrow/Weak AI) performs a specific task as well as it can being - trained to follow specific rules. Examples: voice assistants like Siri or Alexa, recommendation engines on Netflix or Amazon
- Specific technologies behind GenAI are part of the family of AI technologies called machine learning (ML) Central are Generative Pre-trained Transformers (GPTs) and large language models (LLM)
- GenAI produces new content but nothing original





- Generative AI models learn the underlying patterns to generate new data that mirrors the training set
- GPTs (Generative pre-trained transformers - artificial neural networks) could be renamed 'foundation models' - in education a foundation model called 'EdGPT' being developed - EdGPT models trained with specific data to serve educational purposes – trained with high-quality, domain-specific education data
  - \* Remains vital that the users of EdGPT take a critical perspective to any outputs. EdGPT examples: <https://edugpt.com> and <https://math-gpt.org/?model=unlimited> (both for teachers and students)
- Many AI in education (AIED) tools to support teachers and students with vetted sources and in a controlled environment



**Can we see the great potential of EdGPT and AIED tools?**

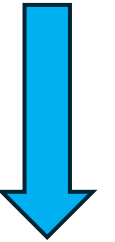


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**Learning Possibilities**

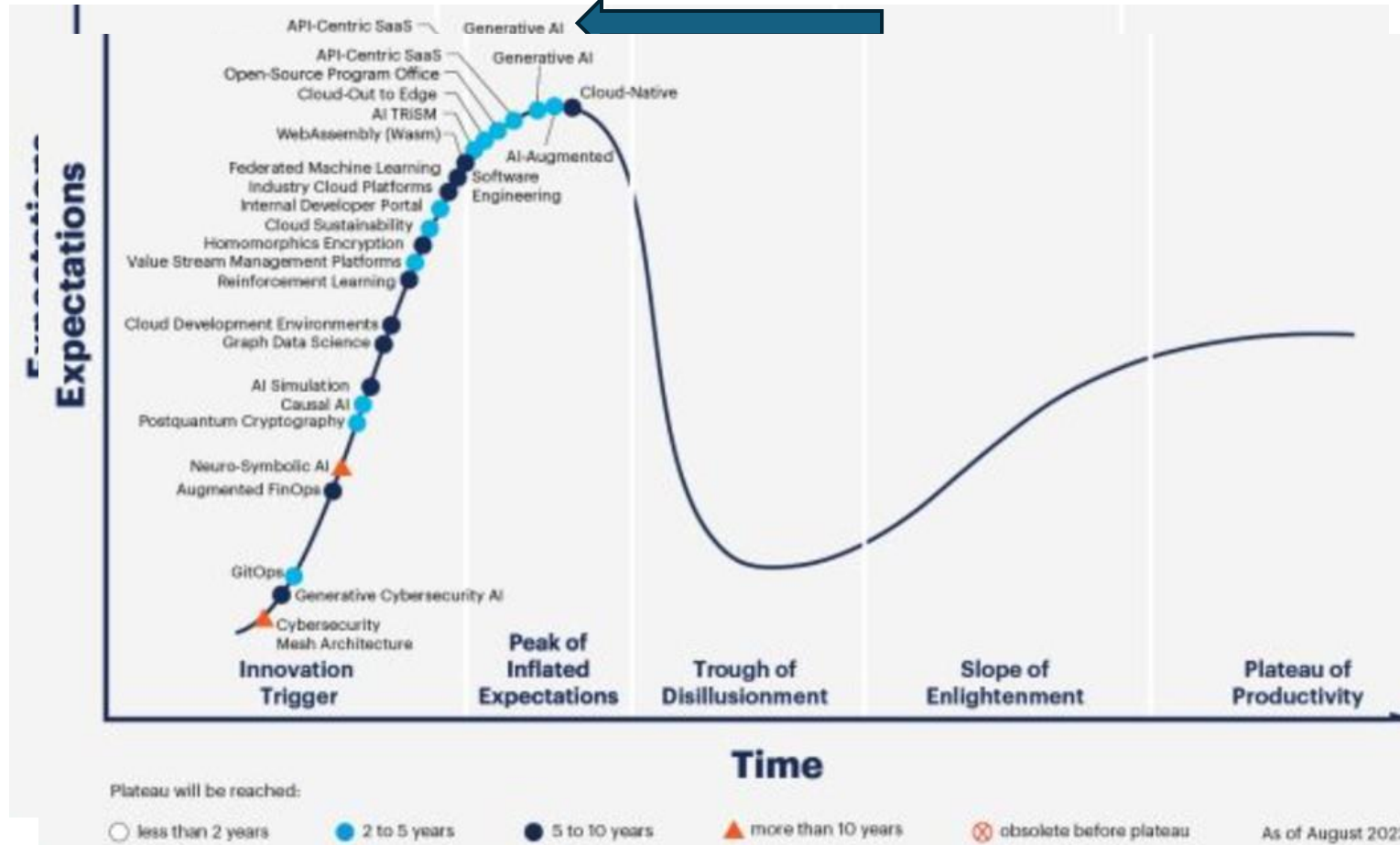
- Cannot generate new ideas or solutions to real-world challenges, as it does not understand real-world objects or social relations that underpin language
- Despite its fluent and impressive output, global GenAIs, with sources uncontrolled, cannot be trusted to be accurate (most GenAI products make it clear that its output may be incorrect)



# Questions so far?



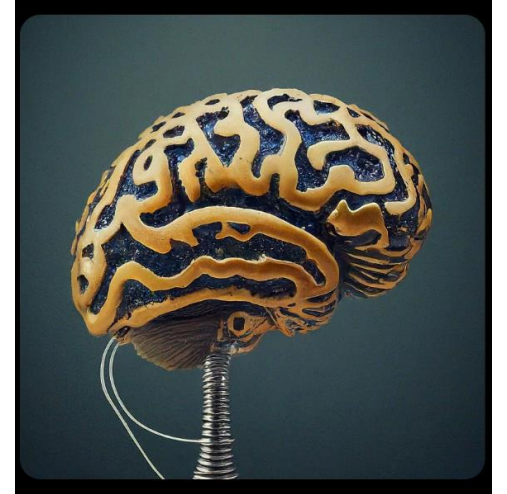
# 2. The benefits and potential of AI in Education



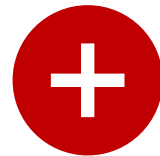
# GENERAL



- Asia - rich linguistic diversity - a breakdown of language barriers in classrooms - enabling teachers to instruct in their native languages, while students can comprehend lessons in their preferred languages
- Language learning and translation: machine translation in existence since 1950s; - current popular machine translation tools *Google Translate*, *Microsoft Translator*, *DeepL*, *Alexa Translations*, etc..
- Use it to inspire new ideas



- Traditional textbooks → create customised books and learning resources (e.g. *Netex Learning*)
- Help to develop lesson plans and presentations
- Summarize existing materials
- Enables delivery of final outputs by generating semi-finished knowledge products
- Stimulate image creation
- New jobs created by AI, requiring training for new vocational skills



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# TEACHERS



- Automated essay scoring/grading: tedious task being automated
- Analyse students' behaviour
- “Teacher’s guide”
- Helps create student groups or cohorts, provide meaningful feedback automatically to large student cohorts, and clusters of learners
- Helps classify students' discussion content to determine if they were course relevant
- Analyze existing curricula and suggest updates, emerging topics, and interdisciplinary learning opportunities; provide tailored suggestions to various educational levels



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# STUDENTS

- Major benefit (top potential benefit in the ASEF survey) = GenAI to assess individual students' performance and predict their learning outcomes for personalised learning (to suit individual learning interests, pace, abilities, and styles) and diverse learning needs, including students with disabilities
- Real-time alerts and feedback to prompt students to participate in online activities
- Intelligent tutoring system: e.g National University of Singapore uses predictive analytics to identify students who are falling behind and intervenes proactively
- AI-driven educational games: adapt in real-time to a student's performance – more engaging



- Control assignment loads of students
- Writing coach
- Educational AI Chatbots: answer students' queries and provide information
- Conversational AI: a conversational “tutor” or teaching assistant - knows the context of the student's learning and nudge students to change their learning strategy; includes chatbots and virtual tutors, offering 24/7 assistance, scaffolding and promoting independent learning - see example MathGPT vs Khan Academy approach



# 3. Examples of GenAI Systems

Khan Academy “ uses a conversational AI approach – it does not provide “the answer”

The screenshot shows the Khanmigo AI tutor interface. On the left, a math problem is displayed: "Equation" and "CCSS.Math: 8." followed by "Solve for  $m$ ." and the equation  $3 - 2(9 + 2m) = m$ . Below the equation is an input field for  $m =$ . On the right, a chat window titled "Khanmigo beta" with "AI power" below it is open. A notification at the top of the chat says "This conversation is recorded and viewable by your teacher." A button "Tell me the answer!" is visible. The AI tutor's response is: "As your friendly AI tutor, Khanmigo, I'm here to help you learn and understand the problem, not just give you the answer. 😊 Let's work through it together! What do you think the first step should be to solve this equation?". Below the chat is a text input field with the placeholder "Type message (do NOT share any personal data)", a microphone icon, a "Clear chat" button, and a send button. At the bottom of the chat window, it says "Khanmigo makes mistakes sometimes. [Here's why.](#)"

Snap, Solve, Submit!

Upload a screenshot and solve any math problem instantly with MathGPT!

MathGPT

MathGPT Vision

MathGPT can solve word problems, write explanations, and provide quick responses.

Drag & drop an image file here, or click to select an image.

Your Problem:

Open in MathGPT Chat

Solve for  $m$ .

$$3 - 2(9 + 2m) = m$$
$$m =$$

Your Solution:



To solve the equation  $3 - 2(9 + 2m) = m$ , we will simplify and solve for  $m$ .

First, distribute the -2 across the parentheses:

$$3 - 2 \cdot 9 - 2 \cdot 2m = m$$
$$3 - 18 - 4m = m$$

Combine like terms:

$$-15 - 4m = m$$

Add  $4m$  to both sides to get all  $m$  terms on one side:

$$-15 = 5m$$

Finally, divide both sides by 5 to solve for  $m$ :

$$m = -3$$

Solved by [math-gpt.org](https://math-gpt.org)

Ask a follow-up question

Submit

I posed the question: “*What is specific about studying in Asia?*”



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# ChatGPT – text <https://chat.openai.com>



You

What is specific about studying in Asia?

< 12 / 12 >



ChatGPT

Studying in Asia offers a unique set of opportunities and experiences due to the diverse cultures, languages, educational systems, and economic landscapes across the continent. Here are some specific aspects of studying in Asia:

1. **Cultural Diversity:** Asia is incredibly diverse, with various cultures, traditions, and languages. Studying in Asia exposes students to this rich diversity, providing opportunities to learn about different customs, cuisines, religions, and lifestyles.
2. **Language Learning:** Many countries in Asia have languages that are vastly different from English, such as Mandarin, Japanese, Korean, Hindi, and more. Studying in Asia offers an immersive environment for learning these languages, which can be advantageous for future career prospects and personal growth.
3. **Top Universities:** Asia is home to some of the world's top universities, particularly in countries like China, Japan, South Korea, Singapore, and Hong Kong. These institutions offer quality education, cutting-edge research opportunities, and strong international networks.



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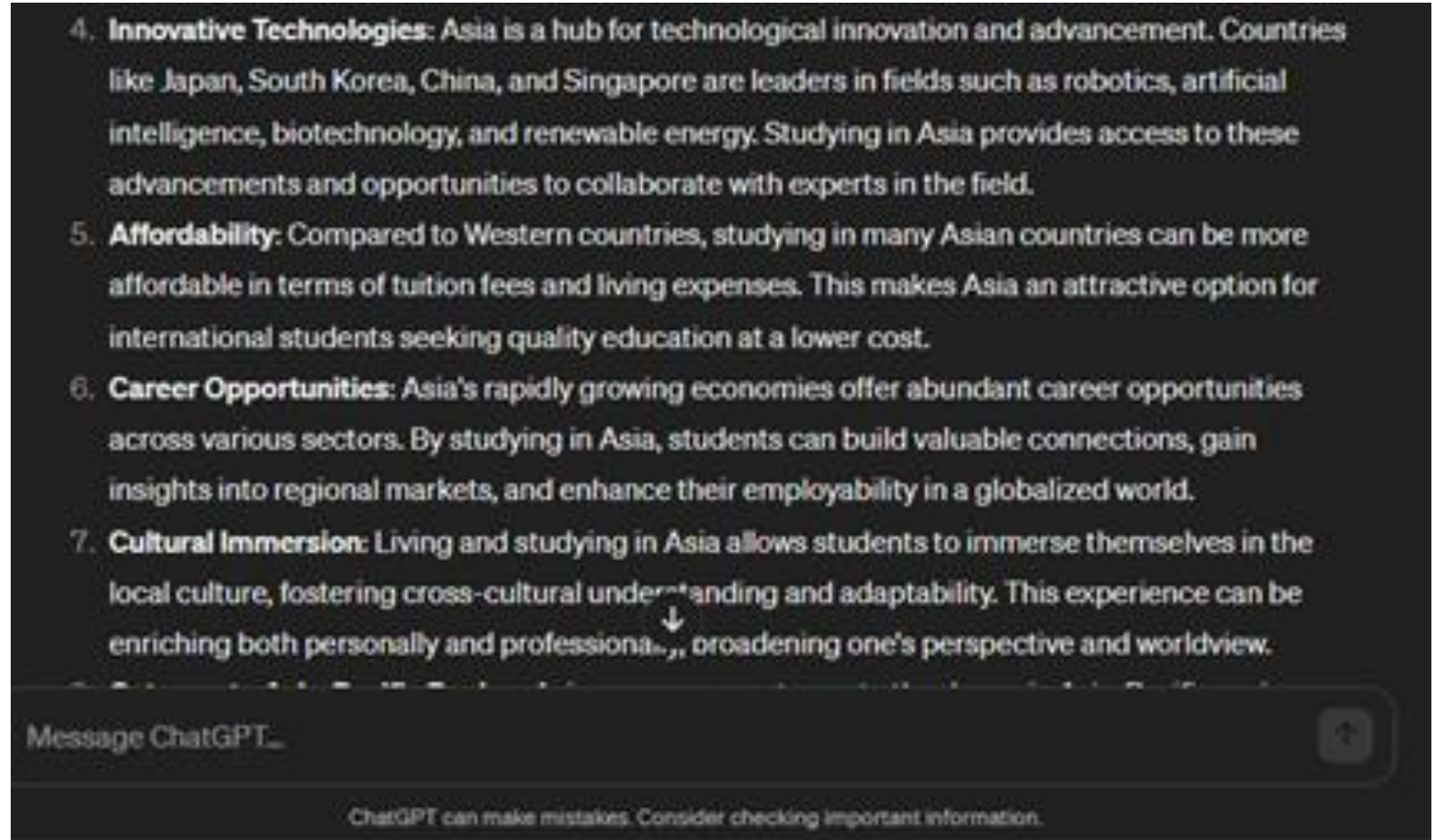


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# ChatGPT – text <https://chat.openai.com>

*“ChatGPT can make mistakes. Consider checking important information.”*

..but all from an international student’s perspective!



4. **Innovative Technologies:** Asia is a hub for technological innovation and advancement. Countries like Japan, South Korea, China, and Singapore are leaders in fields such as robotics, artificial intelligence, biotechnology, and renewable energy. Studying in Asia provides access to these advancements and opportunities to collaborate with experts in the field.

5. **Affordability:** Compared to Western countries, studying in many Asian countries can be more affordable in terms of tuition fees and living expenses. This makes Asia an attractive option for international students seeking quality education at a lower cost.

6. **Career Opportunities:** Asia’s rapidly growing economies offer abundant career opportunities across various sectors. By studying in Asia, students can build valuable connections, gain insights into regional markets, and enhance their employability in a globalized world.

7. **Cultural Immersion:** Living and studying in Asia allows students to immerse themselves in the local culture, fostering cross-cultural understanding and adaptability. This experience can be enriching both personally and professionally, broadening one’s perspective and worldview.

Message ChatGPT...

ChatGPT can make mistakes. Consider checking important information.



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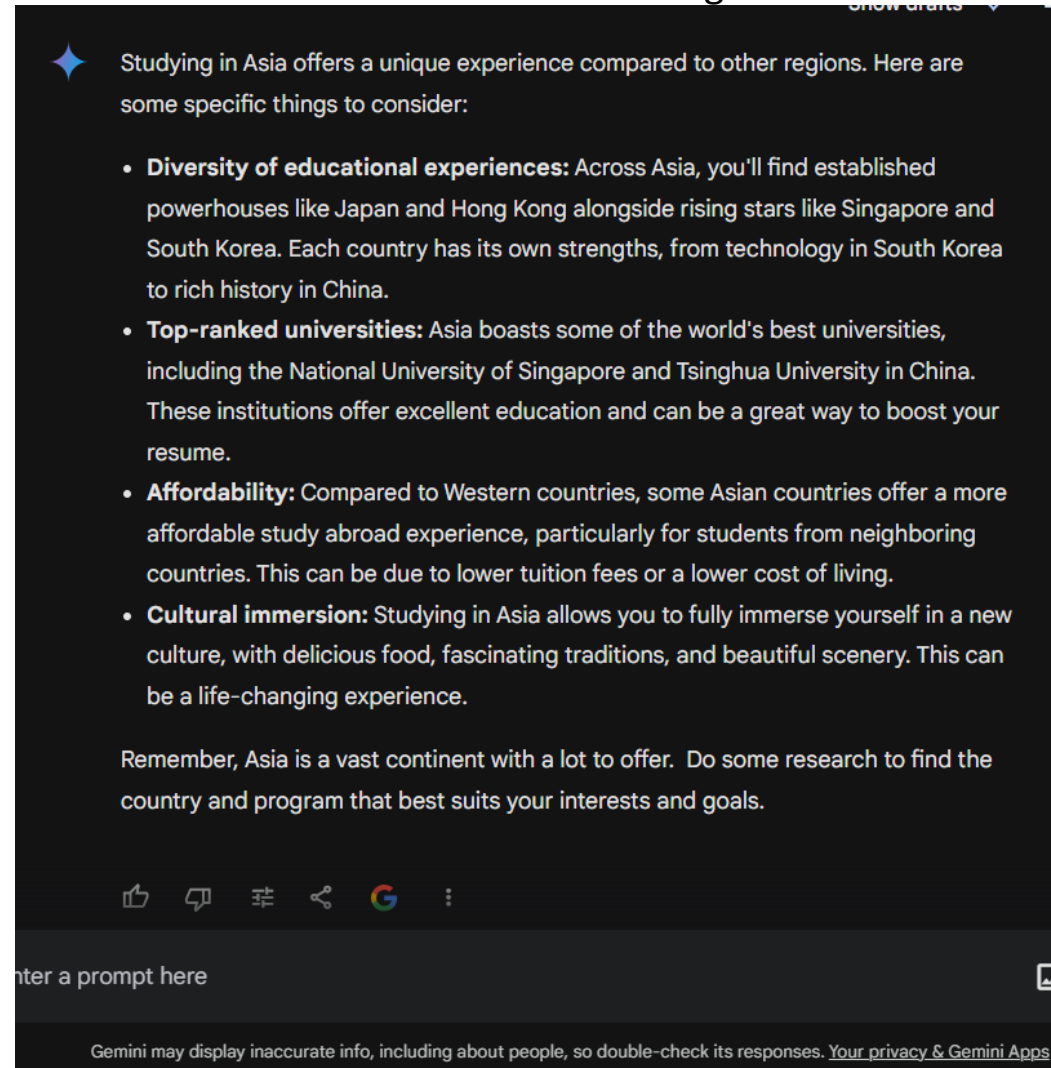


**Learning Possibilities**

# Gemini from Google – text

*“Gemini may display inaccurate info, including about people, so double-check its responses.”*

..but all also from an international student’s perspective!



Studying in Asia offers a unique experience compared to other regions. Here are some specific things to consider:

- **Diversity of educational experiences:** Across Asia, you'll find established powerhouses like Japan and Hong Kong alongside rising stars like Singapore and South Korea. Each country has its own strengths, from technology in South Korea to rich history in China.
- **Top-ranked universities:** Asia boasts some of the world's best universities, including the National University of Singapore and Tsinghua University in China. These institutions offer excellent education and can be a great way to boost your resume.
- **Affordability:** Compared to Western countries, some Asian countries offer a more affordable study abroad experience, particularly for students from neighboring countries. This can be due to lower tuition fees or a lower cost of living.
- **Cultural immersion:** Studying in Asia allows you to fully immerse yourself in a new culture, with delicious food, fascinating traditions, and beautiful scenery. This can be a life-changing experience.

Remember, Asia is a vast continent with a lot to offer. Do some research to find the country and program that best suits your interests and goals.

Enter a prompt here

Gemini may display inaccurate info, including about people, so double-check its responses. [Your privacy & Gemini Apps](#)



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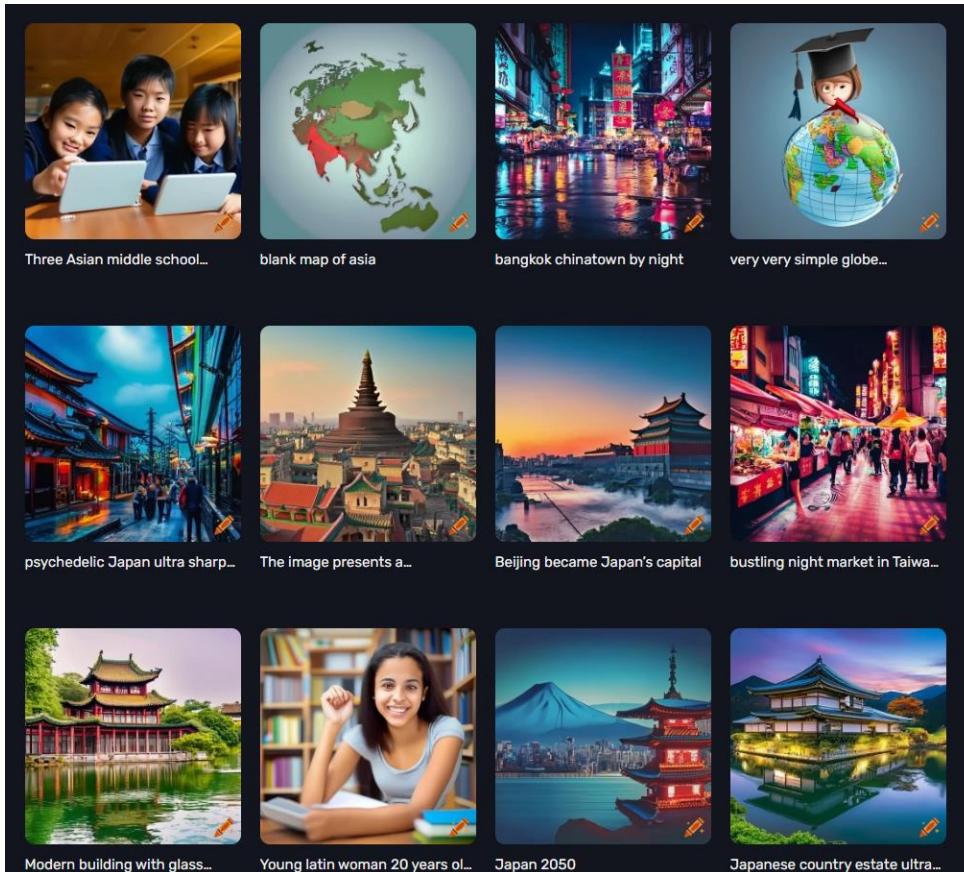
# ImageFX (by Google) - images <https://aitestkitchen.withgoogle.com/tools/image-fx>

*“Images may display inaccurate info, including about people, so please double-check images before using.”*

*“Disclaimer: AI outputs may sometimes be offensive or inaccurate”*



# Craion - images <https://www.craiyon.com>



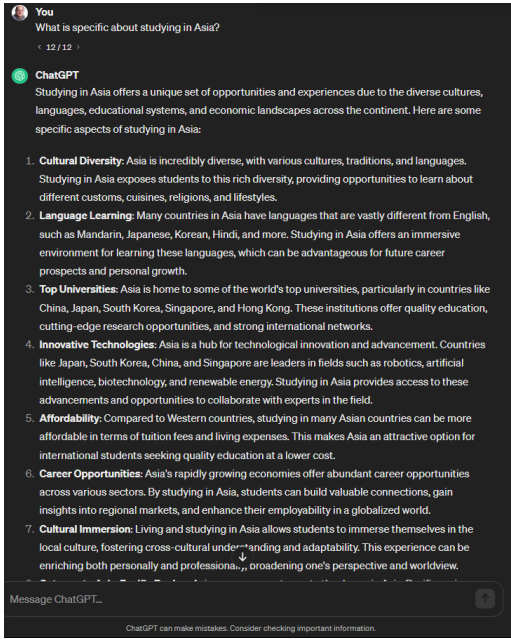
*“Are there biases or limitations in AI generated art? Yes, seeing as it learns through existing images, it is exposed to societal prejudices and harmful stereotypes so can integrate these into its images.”*

*“How does the AI model work? The model learns concepts from images. Each time you enter a prompt, it will create unique images based on its current knowledge and will try to combine the concepts from your prompt in a creative way.”*

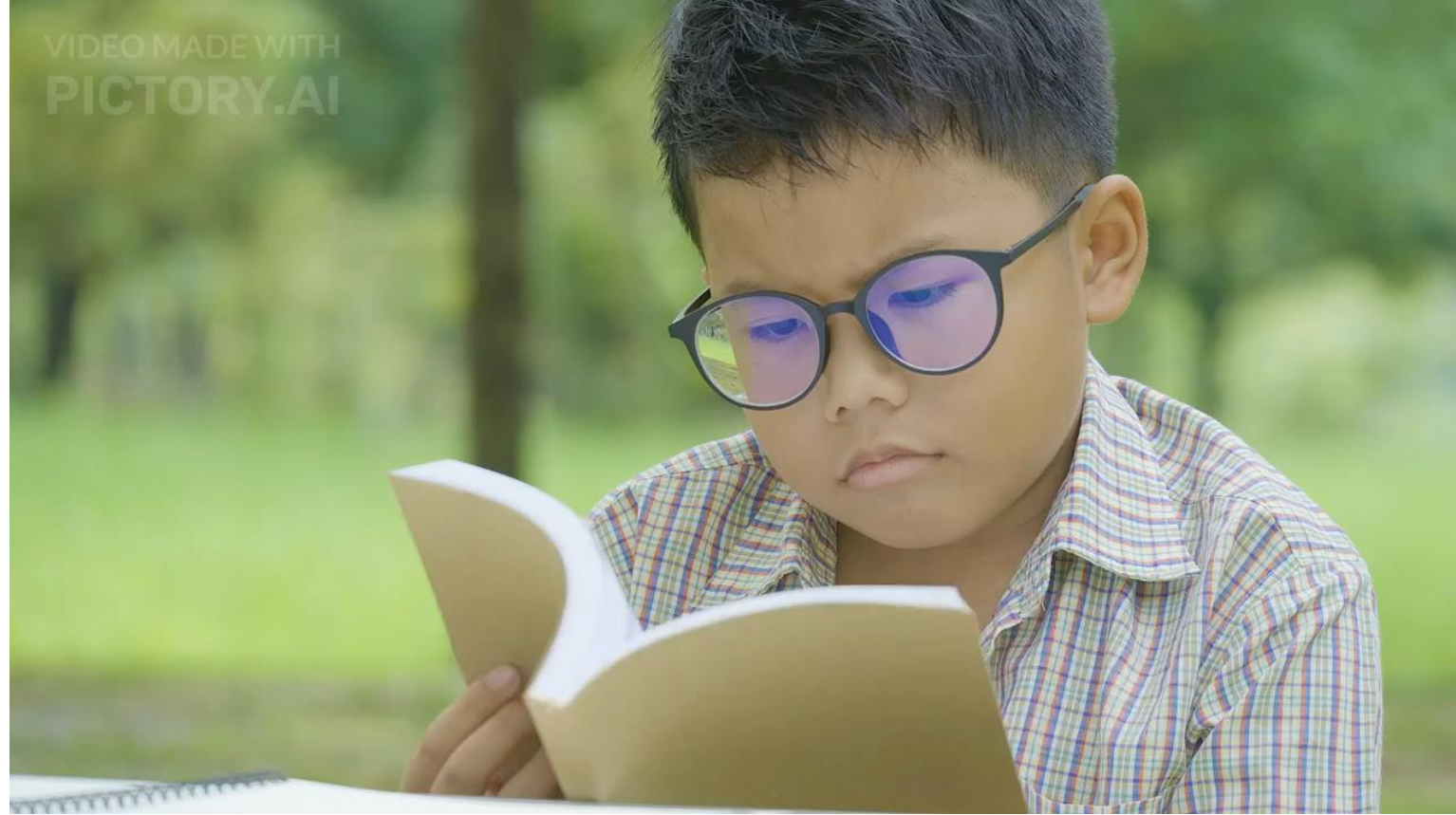


(I fed the ChatGPT text into *Pictory*)

# PICTORY – videos from text [app.pictory.ai](https://app.pictory.ai)



Will a primary / secondary student question the “facts” portrayed in the video?



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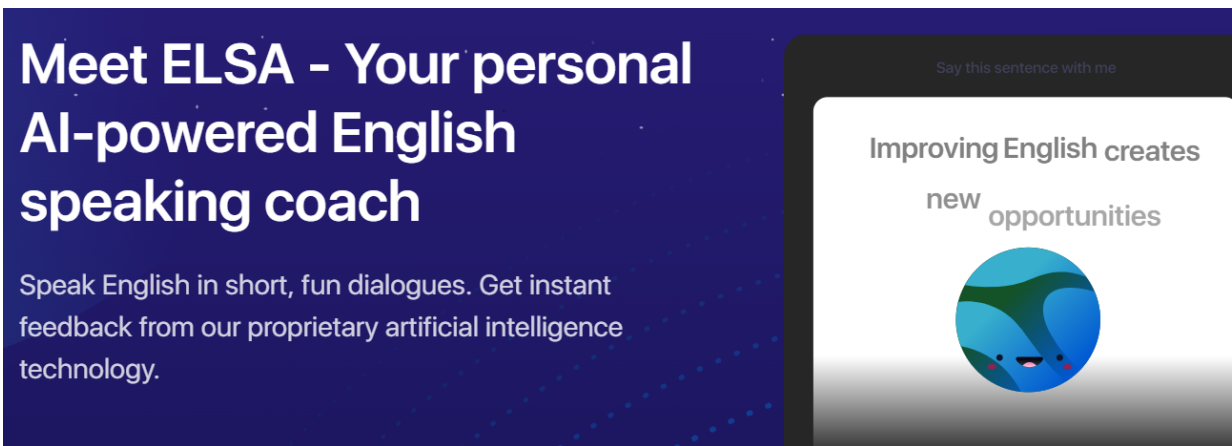
Learning Possibilities



# ELSA

 – assists in speaking/pronouncing English <https://elsaspeak.com>

Example of AI in education (AIED) tools to support teachers and students with vetted sources and in a controlled environment




**Meet ELSA - Your personal AI-powered English speaking coach**

Speak English in short, fun dialogues. Get instant feedback from our proprietary artificial intelligence technology.

Say this sentence with me

Improving English creates new opportunities



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# Questions so far?



# 4. Controversies around global generative AI and their implications for Education



- Some of the top reasons why teachers would not use AI in education in the ASEF survey are:
  - The ethical implications of AI in education
  - The lack of reliability and accuracy of AI-enabled tools
  - That AI-enabled tools might undermine human interaction in teaching and learning
  - A preference for traditional teaching methods which are more engaging and supportive of personal connections between teachers and students, and among students
  - Lack of necessary technology and training
  - Students' lack of ability to use AI-enabled tools critically
  - Lack of quality of student work when AI-enabled tools are used
  - AI's possibly negative impact on students' creative thinking.



**Who agrees with the above?**



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- Safety, manipulation, data privacy, copyright [e.g. the AI-generated song featuring ‘Drake’ and ‘The Weekend’ (Abel Tesfaye) reached millions of listeners before being taken offline due to a copyright dispute]
- More sophisticated outputs need skilled human input (prompt engineering)
- Worsening digital poverty - AI often don’t work well on shared devices and low internet connectivity



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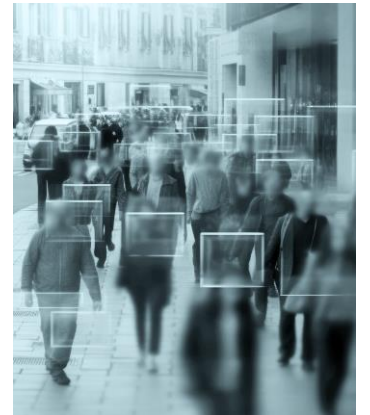
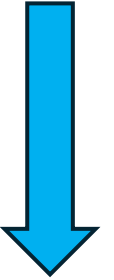


**Learning Possibilities**

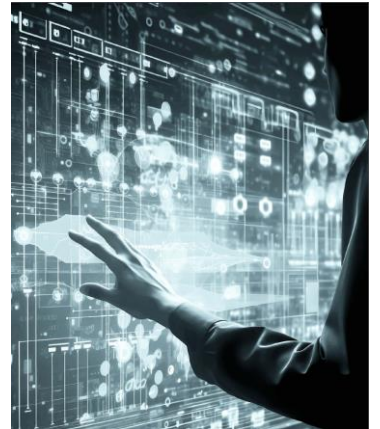
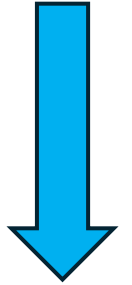
- Use of content without consent scraped from the internet - and usually without any owner's permission - accused of violating intellectual property rights (several ongoing international legal cases).

GPTs may contravene laws such as the European Union's (2016) General Data Protection Regulation, especially people's right to be forgotten, as it is currently impossible to remove someone's data (or the results of that data) from a GPT model once it has been trained

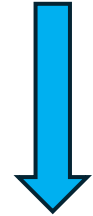
- GenAIs are usually 'black boxes' - their inner workings are not open to inspection – thus not 'transparent' or 'explainable', and it is not possible to ascertain how their outputs were determined.



- AI-generated content polluting the internet:
  1. developers need to implement 'guardrails' to prevent GPT output from being offensive and/or unethical.
  2. biased materials generated by GenAI are increasingly spreading throughout the internet, polluting one of the main sources of content or knowledge for most learners across the world
- Lack of understanding of the real world
- AI-enabled systems today are not genuinely intelligent in any meaningful sense
- Often more related to competition among tech giants to make profits



- Reducing the diversity of opinions
- Generating deeper deepfakes
- Reducing human relationships further



**It is essential that we recognize that global GenAI at present can never be an authoritative source of knowledge on whatever topic it engages with**



# Questions so far?



# 5. Implementing AI in Education

- To achieve widespread AI adoption, countries need
  - policy frameworks
  - cultural localization efforts
  - reliable IT infrastructure
  - internet access, and
  - teacher training.

Train learners:

- critical thinking and information literacy
- develop adaptability and creativity to frame efficient prompts, iterate based on results ('Prompt-engineering')
- ethical awareness must be instilled in students

The response, at all several levels, should be integrated and comprehensive.

# Immediate areas for consideration

## For Governments/ Policymakers

1. Form a multi-stakeholder, national-level advisory body on AI in education
2. Establish national frameworks, regulations, ethical standards and recommendations for generative AI and education
3. Incorporate AI components in teacher education
4. Create a centralized resource repository of generative AI in education
5. Introduce AI literacy in early childhood, elementary and secondary curricula
6. Foster partnerships with AI industry for the localization of AI solutions
7. Promote regional cooperation and knowledge exchange
8. Support and incentivize generative AI innovation or practices that cater to local needs and are inclusive and accessible to all educators and learners in the community.



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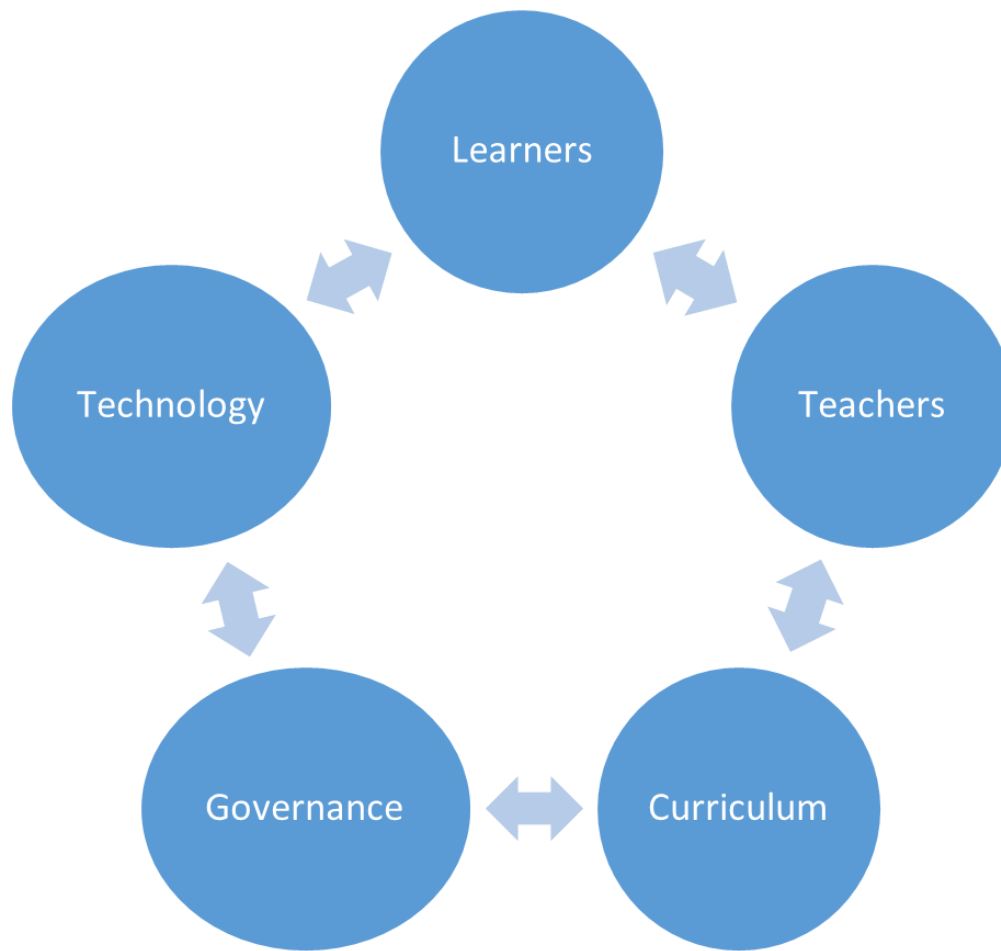


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For Institutions/Schools:

1. Develop clear policies or guidelines on student AI use
2. Upskill students for responsible and ethical generative AI use for learning
3. Update curricula and assessments to focus on skills that AI cannot replicate
4. Build teacher competencies for effective generative AI integration
5. Prioritize inclusiveness and bridge digital divides
6. Implement monitoring mechanisms and support evidence-based research

An integrated and comprehensive approach



(Uys P.M, 2022)

# Concluding remarks

- ✓ EdGPT type of foundation models aim to refine the model with smaller amounts of high-quality, domain-specific education data
- ✓ AI in education (AIED) tools to support teachers and students with vetted sources and in a controlled environment
- ✓ Personalised learning a great benefit – addressing needs of people with disabilities
- ✓ GenAI has great potential for K-12 (and other levels of learning) but only in 2-5 years we will better understand how helpful it really has become!



- Reducing human relationships further
- GenAI has enormous ethical implications given its power and proximity to some basic human thinking processes
- We need to know the sources used and the rationale for selecting sources (the algorithms) otherwise there could be hidden algorithmic bias
- The most fundamental perspective is still about the complementary relationship between human agency and machines.



**Who thinks humans would wish to hand over higher order ability to machines?**



- ❖ AI must not usurp human intelligence
- ❖ The sources should be appropriate, vetted and balanced
- ❖ Conversational AI an appropriate pedagogical approach
- ❖ Information literacy and critical thinking for learners and teachers - even more vital



**How do you feel now? Who are excited? Who are worried? Who are both?!**



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## Who believe we can stop the use of AI in education?

→ Adopt a progressive approach rather than seek to prohibit their use, students and staff need to be supported in using GenAI tools effectively, ethically and transparently



we make the  
road by  
walking

(Horton, M. & Freire, P., 1990)



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# FUTURE MAKERS



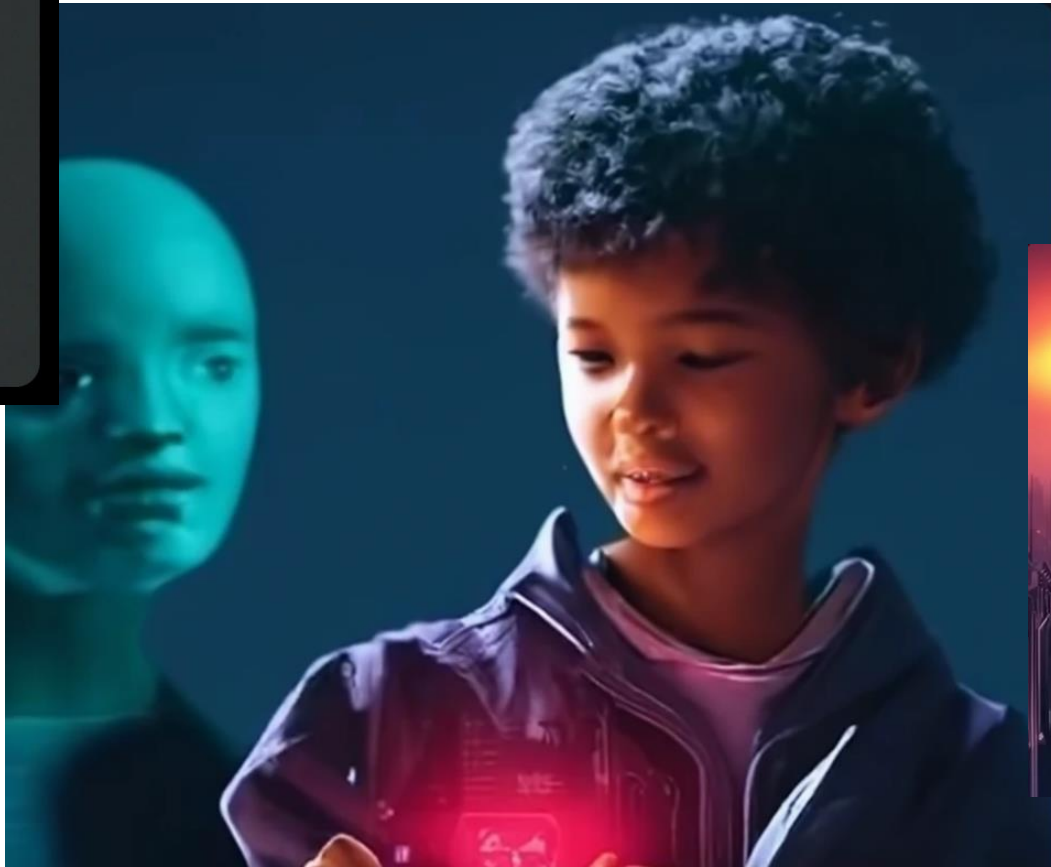
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I WOULD NOT PREFER THIS FUTURE...



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.. BUT RATHER A FUTURE WHERE HUMANS ARE SUPPORTED ALSO BY AI TO BE MORE HUMAN!



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# THANK YOU



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# Key terms

AI in education (AIED)

‘Prompt-engineering’ - framing efficient prompts and iterate based on results

Generative artificial intelligence (GenAI)

Machine learning (ML) - GenAI part of this family of AI technologies, uses data to automatically improve its performance.

Generative Pre-trained Transformers (GPTs - artificial neural networks)) and large language models (LLM) that can recognize and generate text are central.

GPTs could be renamed ‘foundation models’ - in education a foundation model called ‘EdGPT’ is being developed



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