

Hong Kong, CITERS, HKU 16 May 2026



# Using Generative AI in Education: From Research to Policy

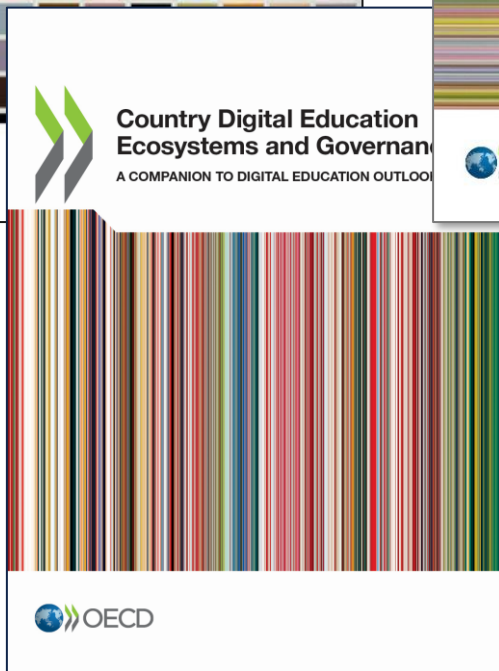
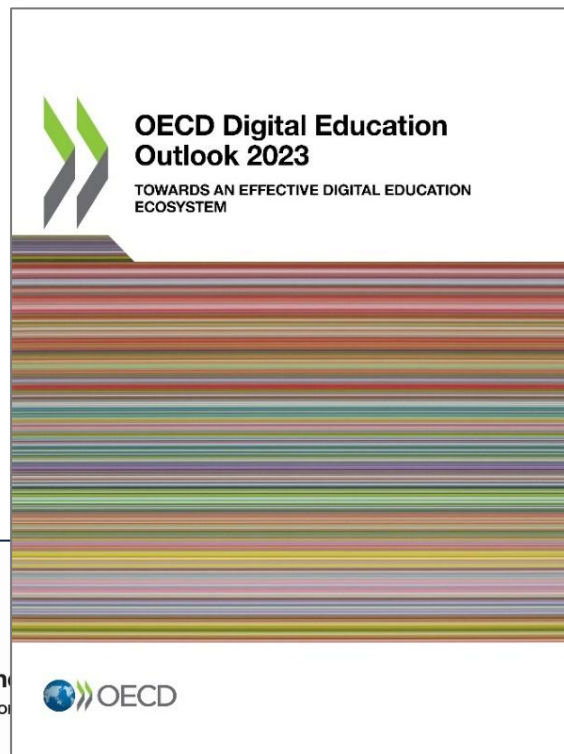
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# OECD Digital Education Outlook Series



## 2021

- What are the current frontiers of AI and other technologies in education?
- What are the upcoming challenges?

## 2023

- What soft and hard infrastructure do countries provide to support digital education?
- How do countries govern the main aspects of digital education (privacy, procurement, interoperability, genAI, development, implementation, etc.)?



# The OECD Digital Education Outlook 2026



## OECD Digital Education Outlook 2026

Exploring Effective Uses of Generative AI in Education



- What are the effects of Generative AI (GenAI) on learning, when general-purpose and educational?
- How can GenAI augment teachers' performance?
- How can GenAI support back-end workflows and research in education?

**1**

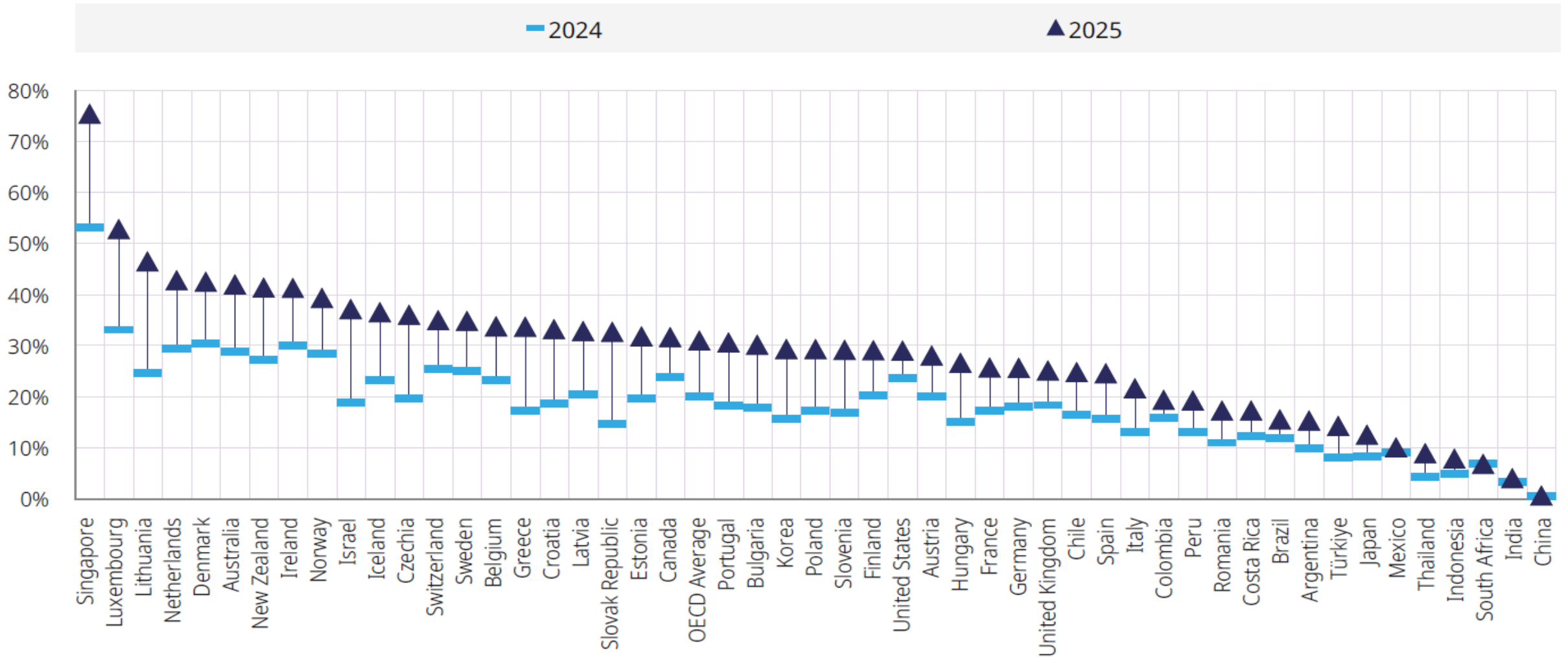
**a fast uptake of generative AI**





# GenAI is increasingly used by the general population and much more so among young people

## Share of ChatGPT users among Internet users

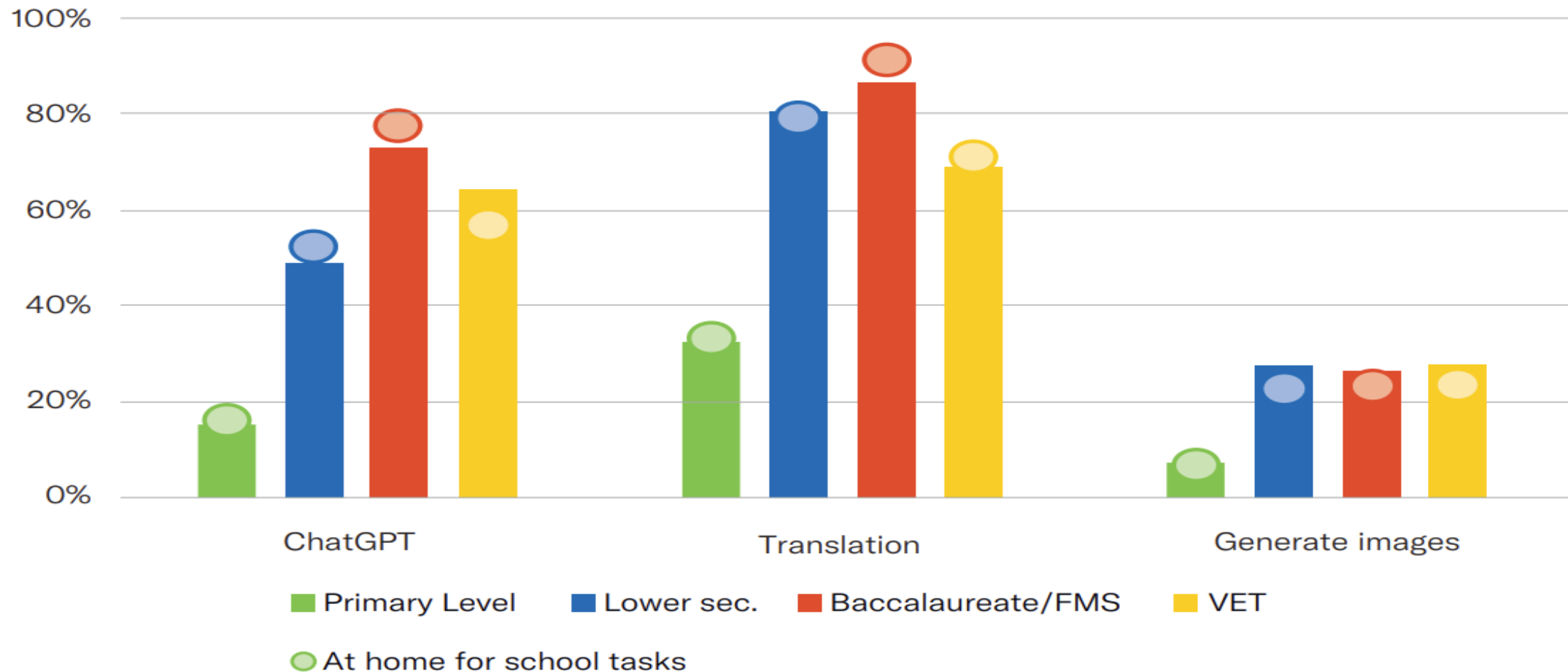




# Students' uptake of AI increases with educational level (and age)

## Use of different AI types in class and at home, by educational level

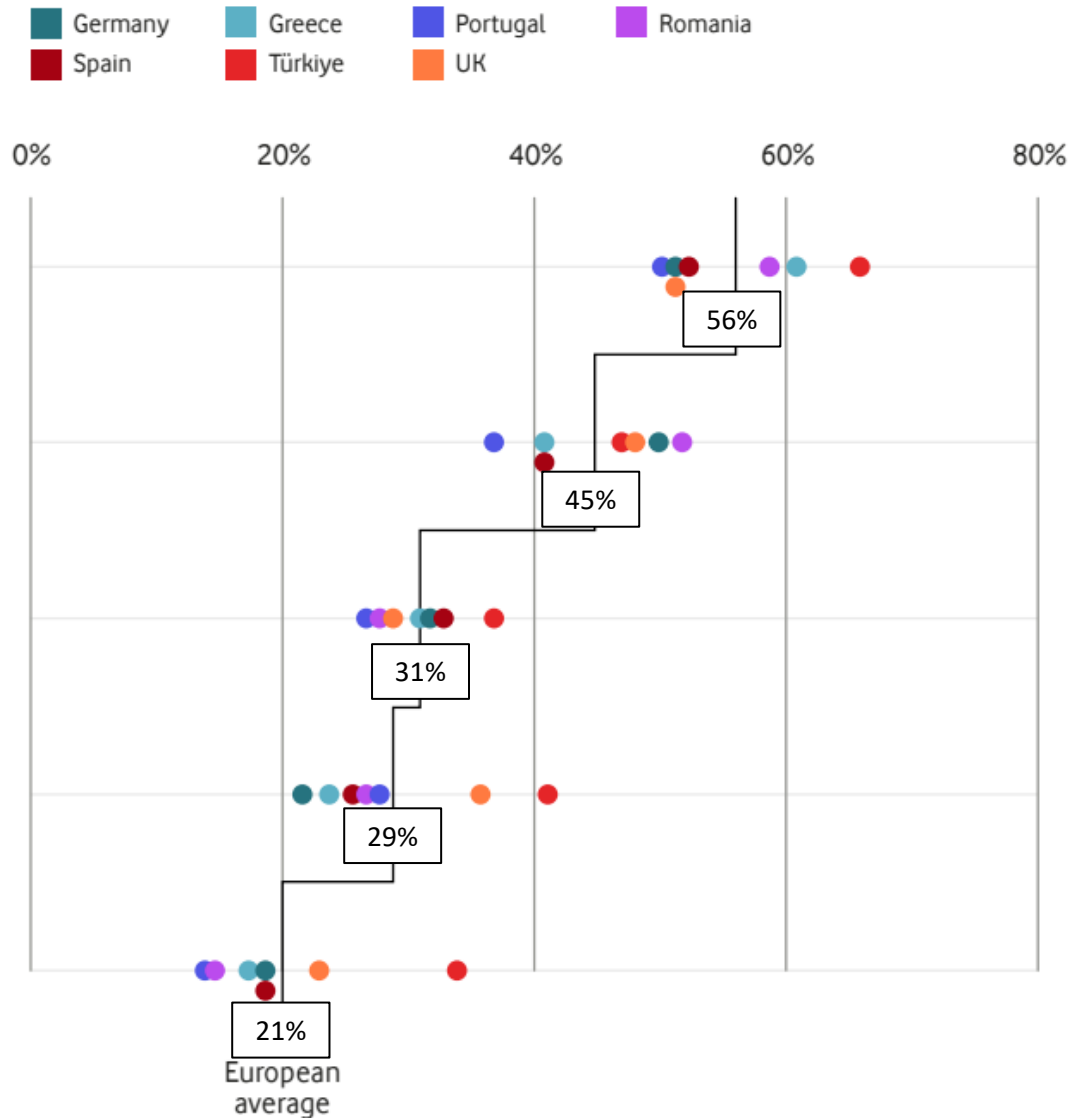
Statistically representative survey of 8-18-year-olds in Switzerland, 2024





# On their own, students use Generative AI as an augmented search engine more than as an interactive tool

“What do you currently use AI applications for when learning **outside of school** and **not being instructed** by your teachers?”



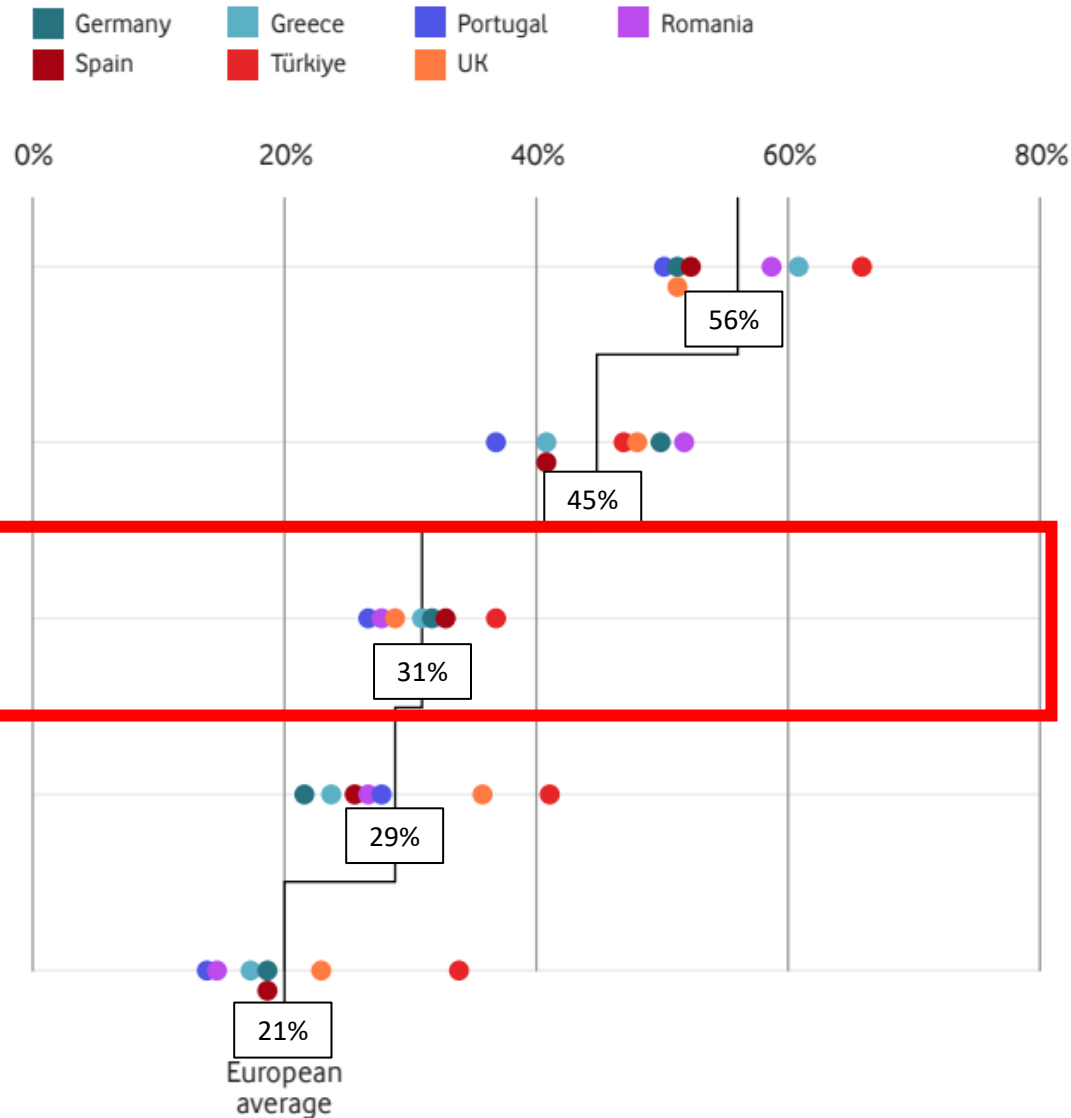
From consultation...

... to interactivity



# On their own, students use Generative AI as an augmented search engine more than as an interactive tool

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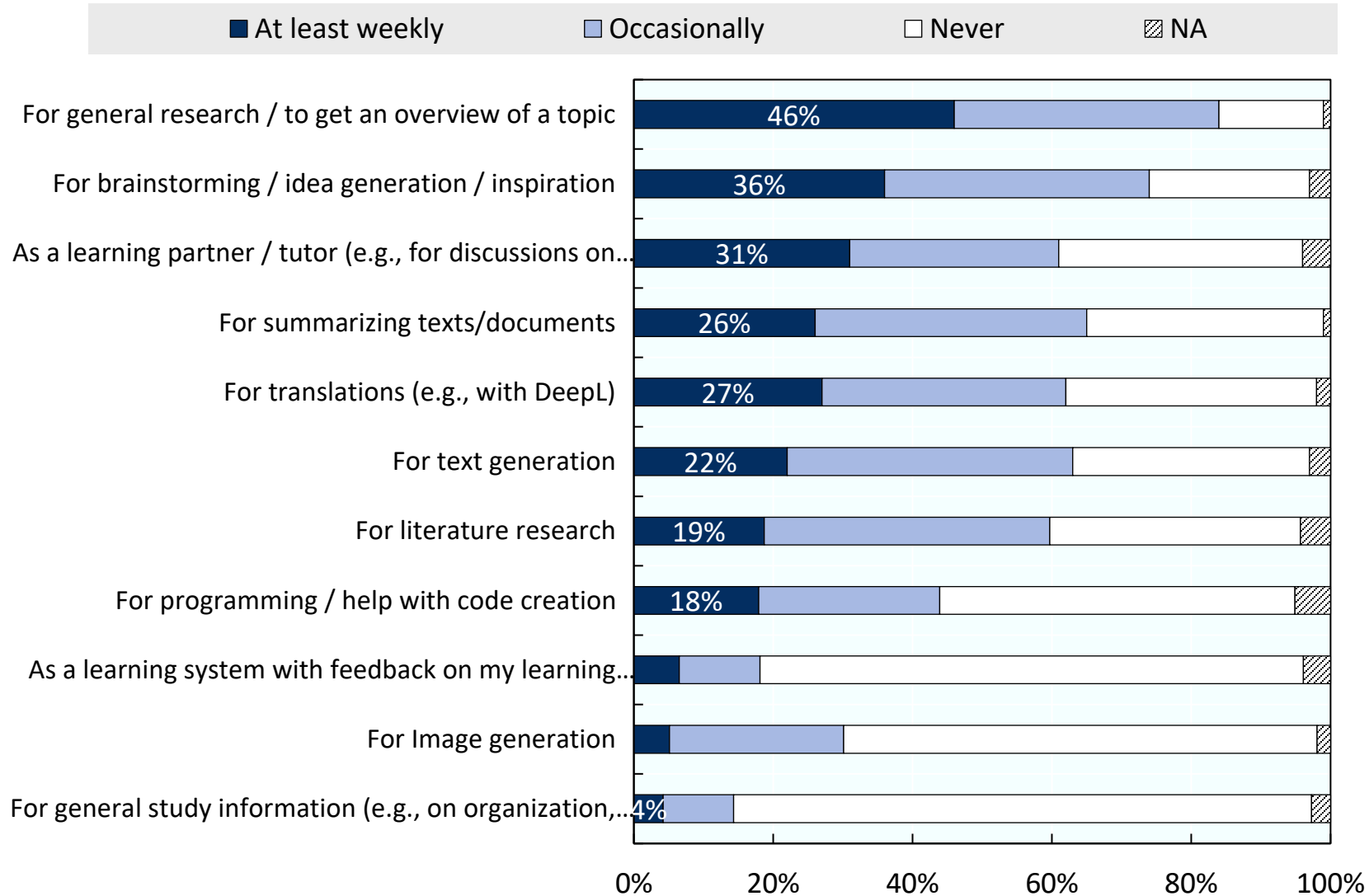


From consultation...

... to interactivity



# Use is even greater in higher education with similar purposes as high school students



Survey of higher education students in **Germany** and **Austria**:

- **94%** used AI in 2025
- **65%** used it at least weekly
- Mostly for consultation, idea generation, inspiration, translation
- More rarely for content generation (text, image, code) or study help (feedback on learning, guidance)

# And teachers have also started to use it (TALIS 2024)

Share of lower secondary teachers who agree with the following statements

● OECD average ● Education systems | Lowest value | Highest value



**2**

**can GenAI tools enhance student learning?**





does general-purpose GenAI  
(automatically) improve learning?



## Example 1: Short and longer term effects of AI (Turkey)

1000 high school students in Turkey (grades 9, 10, 11)  
on logic and arithmetics

### Randomised control trial:

- 1) All students get taught the maths content
- 2) Practice the taught content with 3 conditions:
  - 1) They learn with course notes and textbook (control)
  - 2) They learn with general LLM (GPT base)
  - 3) They learn with instructional LLM (GPT Tutor)
- 3) All groups take same test (with no GPT)





## Example 1: Short and longer term effects of AI (Turkey)

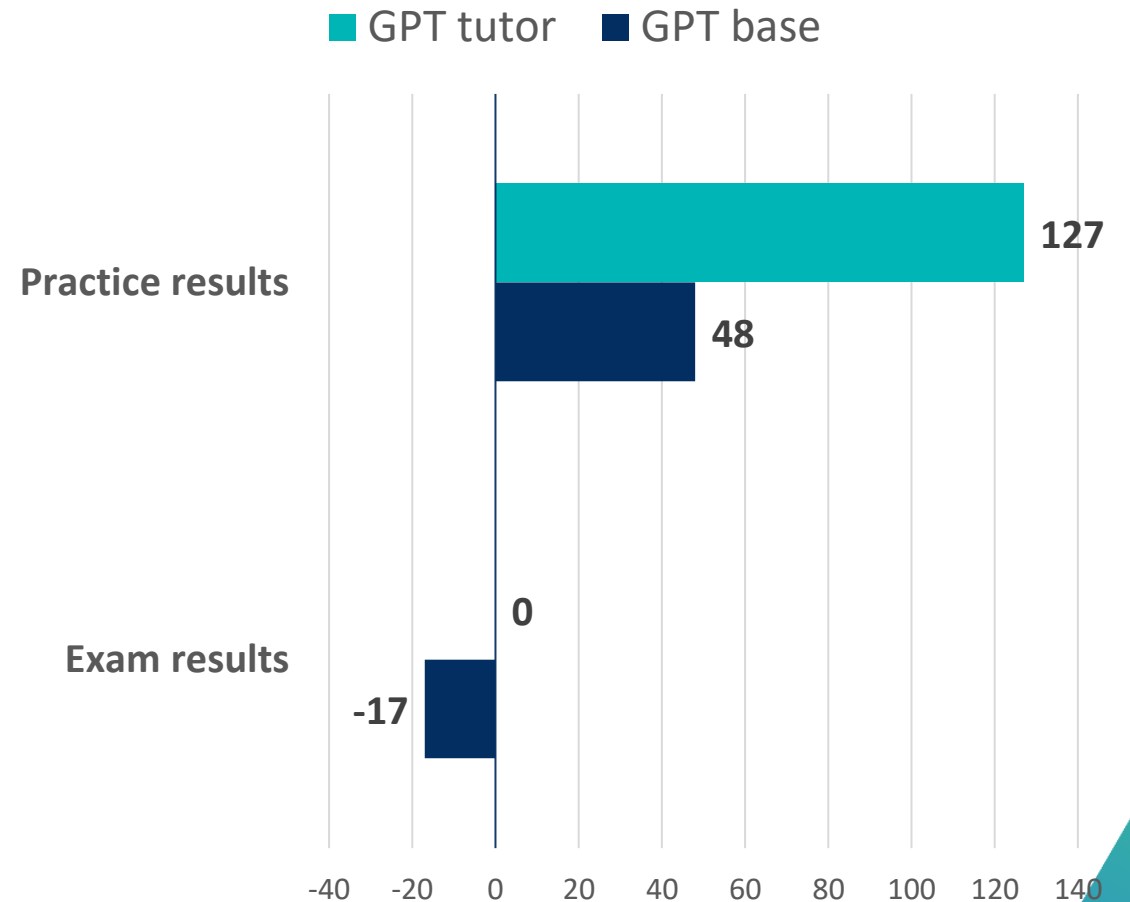
Increased performance (correct solutions) during practice for both GPTs, with much stronger one for GPT Tutor

Inferior performance of GPT base and similar performance at exam (with no GPT)

One reason is that those using GPT base asked for (and got) the answer during practice (and thus learnt less)

Strong engagement of students during practice mode

Percentage increase/decrease in performance compared to control group





## Example 2: How students seek help from humans and from LLMs (China)

### Question:

Do students have different processes when seeking help from LLMs and human experts?

### Method:

- RCT with 38 university students starting by writing an essay in English by themselves
- 2 conditions for revising one's essay:
  - ◆ Seek help from ChatGPT
  - ◆ Seek help from human expert
- Measures: telemetry and observation
- Four help seeking activities:
  - ◆ Diagnosing question
  - ◆ Asking Help
  - ◆ Evaluating Help
  - ◆ Processing Help

Chinese native-speakers writing an essay in English

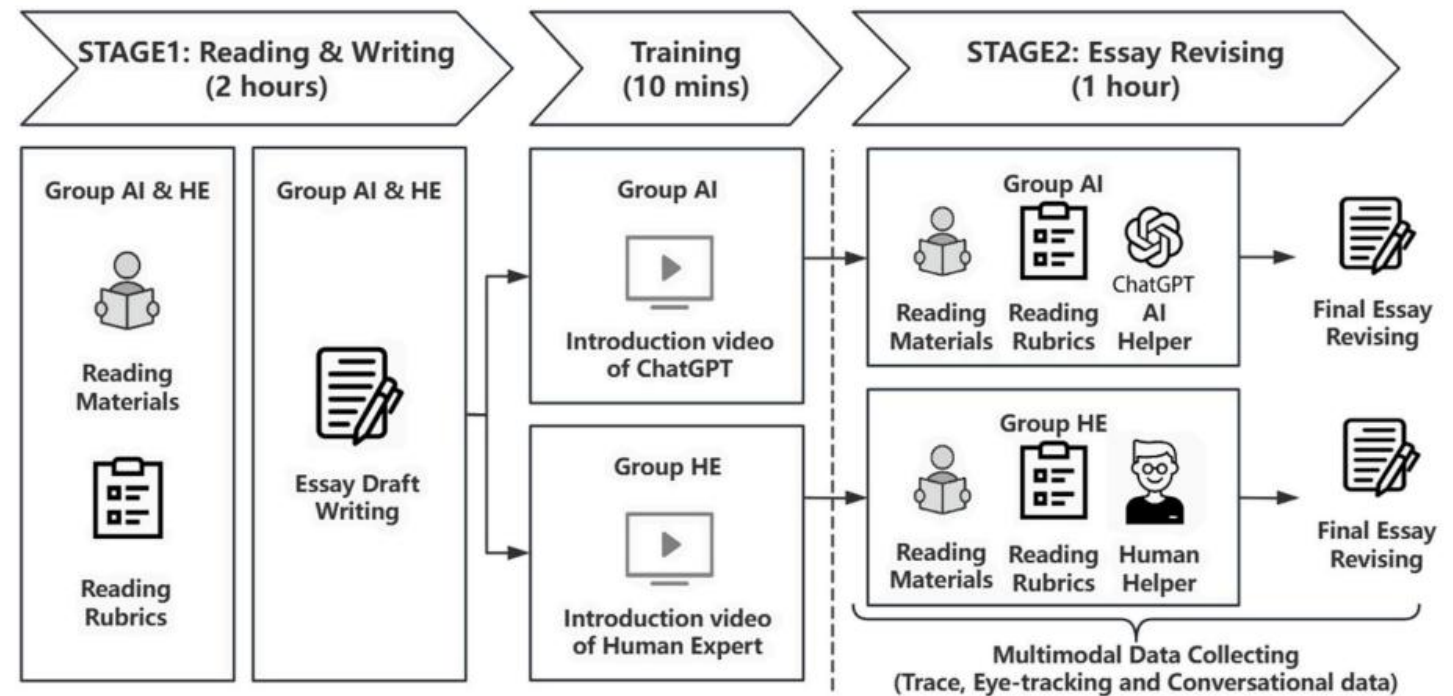


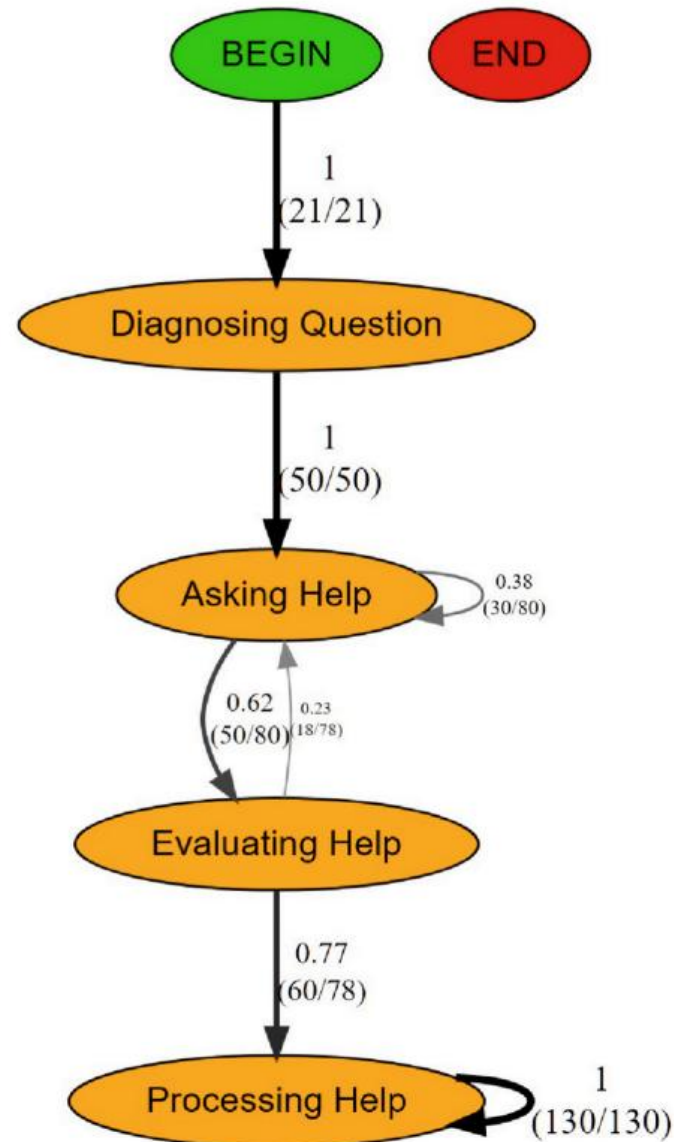
Fig. 1. Experiment procedure.



## Example 2: How students seek help from humans and from LLMs (China)

### Findings

- 1) The “human” group seeks help in a linear way, following the classic “help seeking” theory





## Example 2: How students seek help from humans and from LLMs (China)

### Findings

- 1) The “human” group seeks help in a linear way, following the classic “help seeking” theory
- 2) The human-LLM group has a more “circular” strategy and uses less “diagnosing” questions and evaluate less the help : **more “operational” approach**
- 3) Difference: more evaluation of help by humans, more processing of help by AI group – more thinking vs more tinkering?

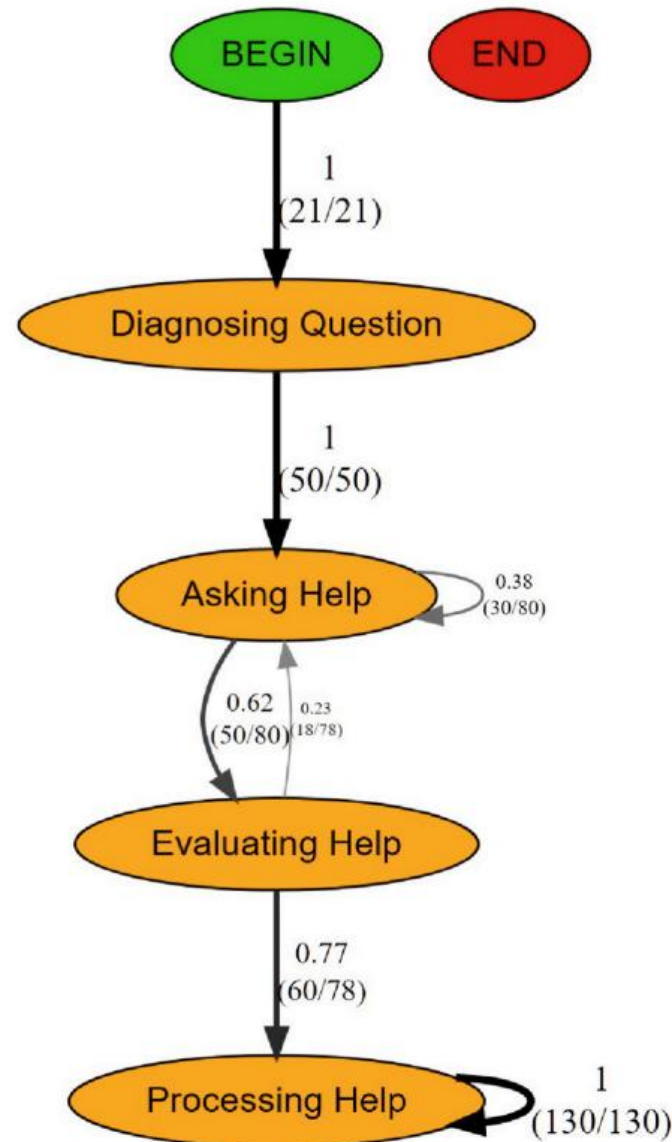


Fig. 5. Help-seeking process temporal pattern in stages in HE Group.

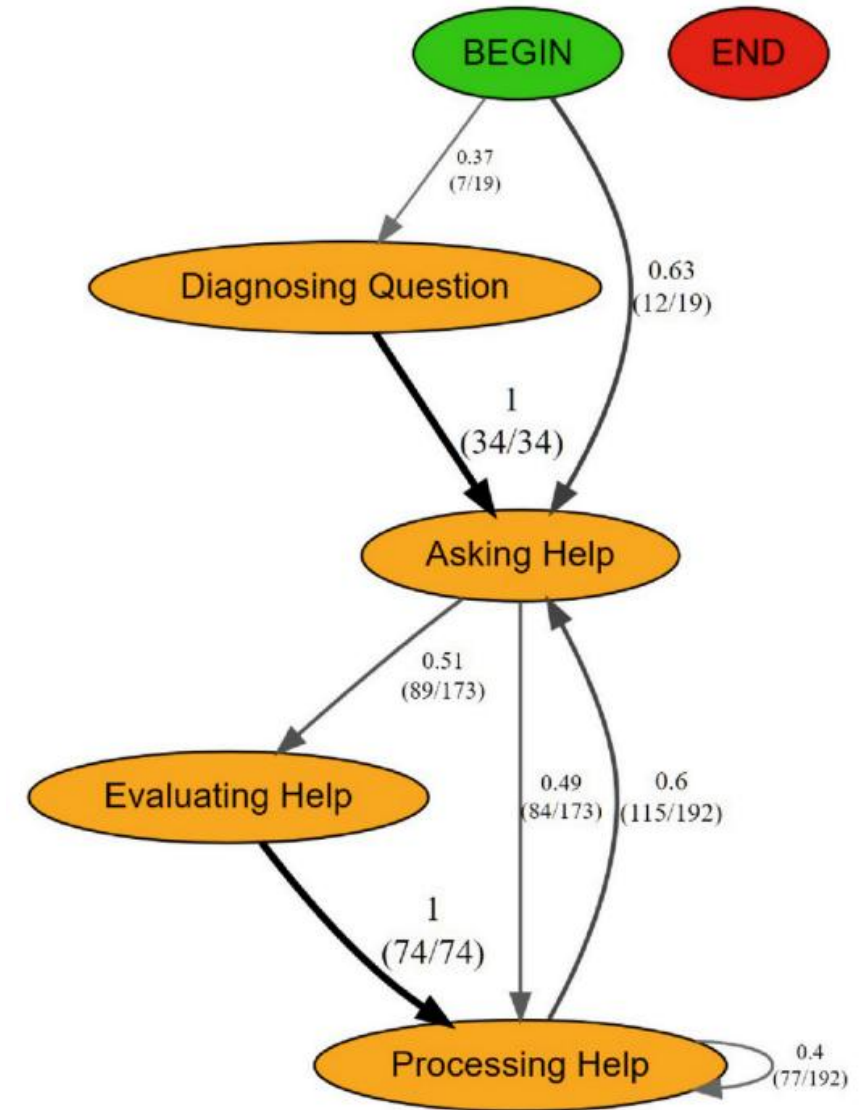


Fig. 4. Help-seeking process temporal pattern in stages in AI Group.



can general-purpose GenAI improve  
learning?



# Example 1: Fostering creativity and communication

## Writing (short) stories with and without GenAI ideas

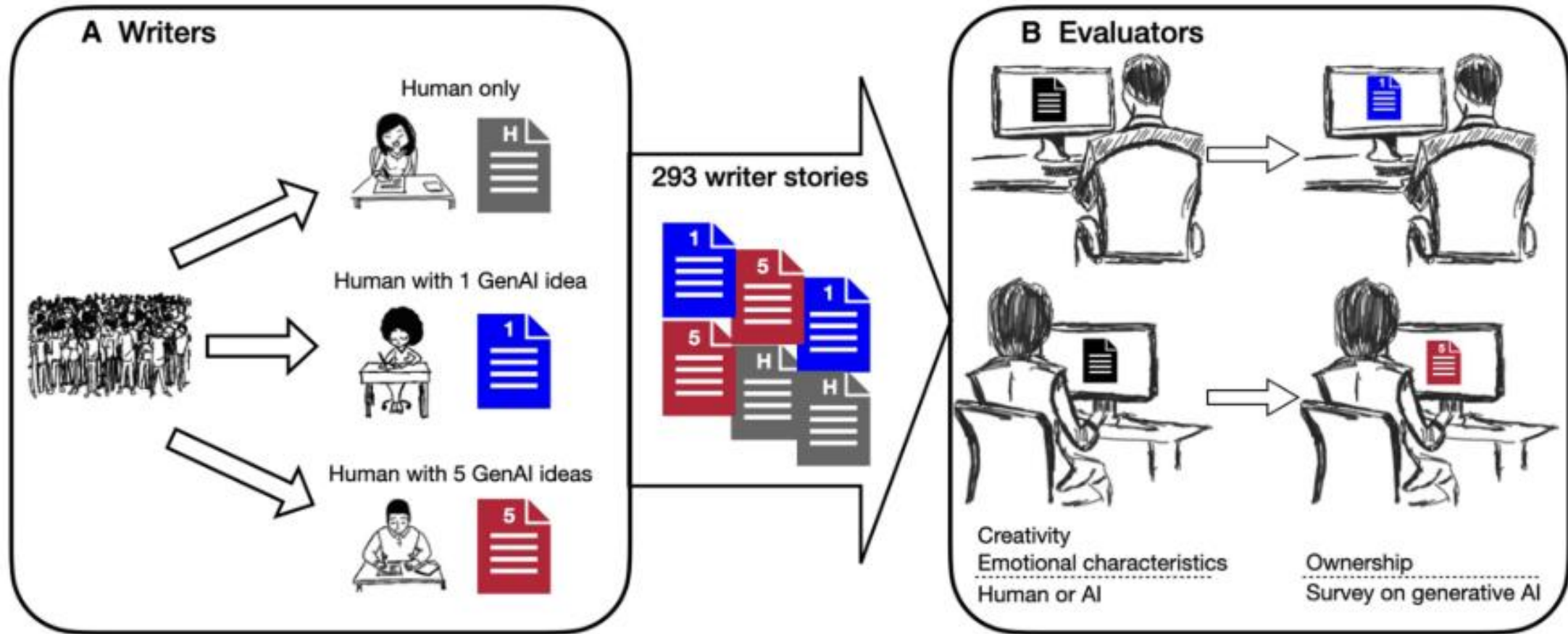
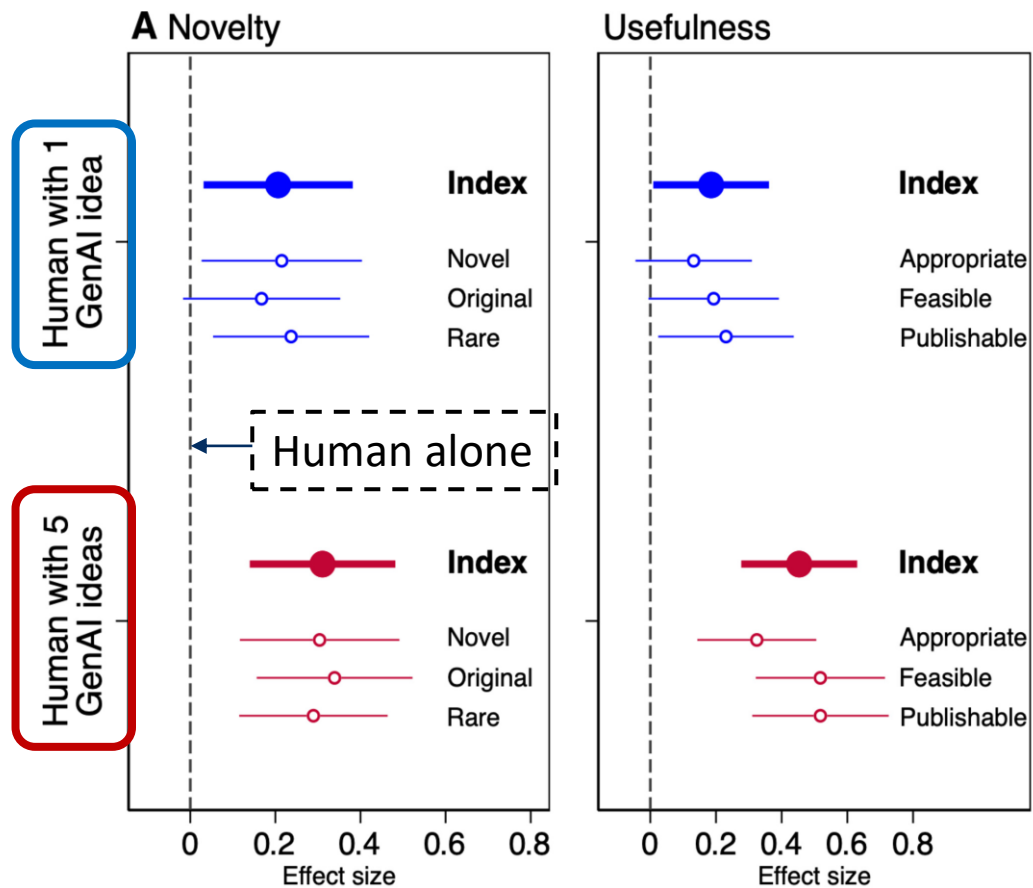


Fig. 1. Visual representation of experimental design.



# Example 1: Fostering creativity and communication

## Writing (short) stories with and without GenAI ideas



Access to generative AI ideas leads to stories evaluated (by humans) as:

- More creative (especially among less creative writers)



# Example 1: Fostering creativity and communication

## Writing (short) stories with and without GenAI ideas



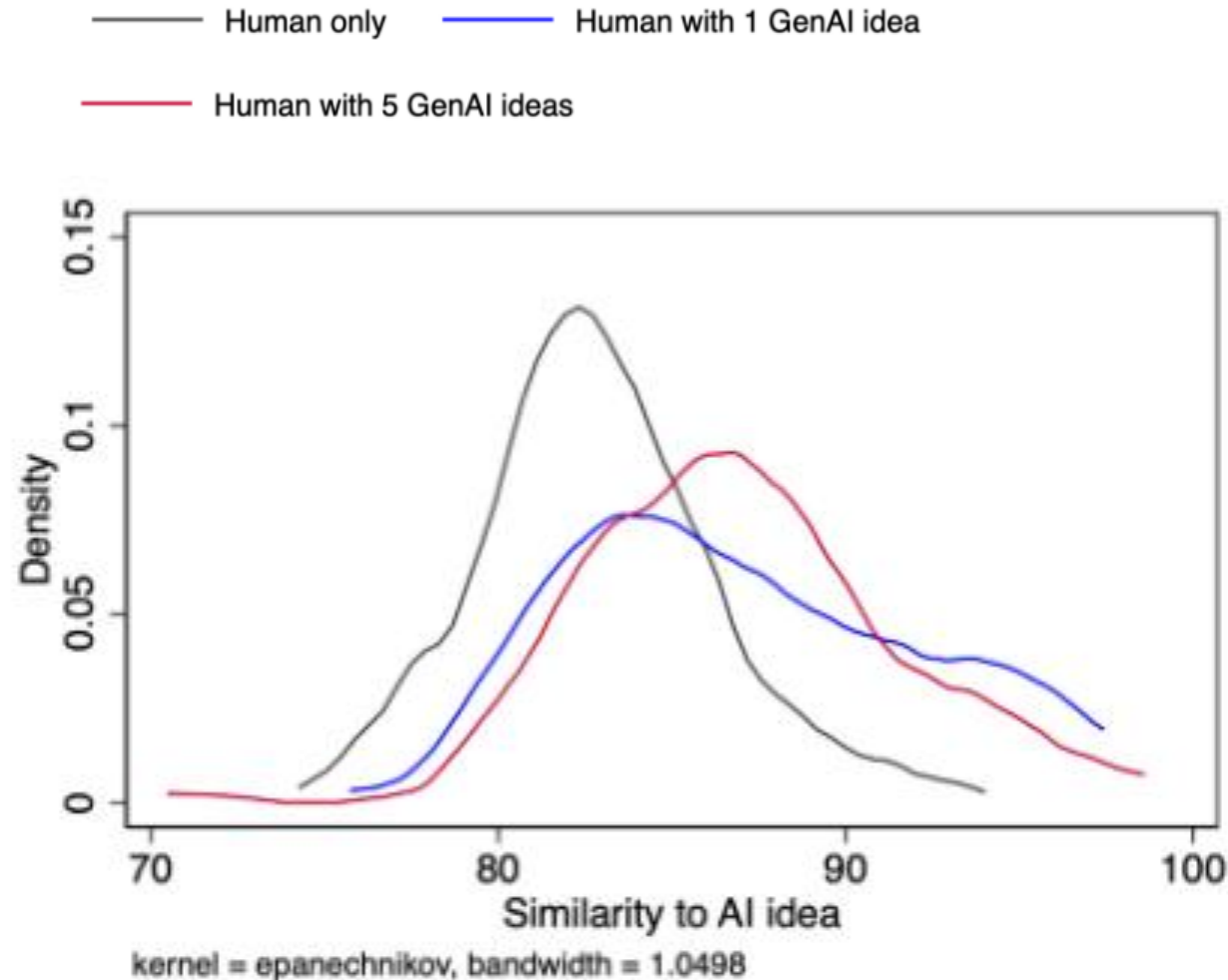
Access to generative AI ideas leads to stories evaluated (by humans) as:

- More creative (especially among less creative writers)
- Better written
- More enjoyable
- But (slightly) less funny



## Example 1: Fostering creativity and communication

### Writing (short) stories with and without GenAI ideas



**But** the pools of GenAI-assisted stories exhibit **higher similarity** (less variety) to an AI production and with each other than the pool of human-only stories.

→ Increase in creativity of individual output and writing effectiveness at the risk of losing collective novelty?



## Example 2: Keeping same learning gains with or without LLM in computer programming course (Slovenia)

**Question:** How to change the tasks and assignments so that the access to ChatGPT does NOT make a (negative) difference on learning?

**Controlled Experiment** with **182 1<sup>st</sup>-year HE students** in **2 groups** (object-oriented programming):

1. Use of ChatGPT for practical assignments
2. No use of ChatGPT for practical assignments

**Course structure (15 weeks):**

- 1) 11 mandatory and 11 optional home practical assignments
- 2) Lectures followed by Lab session in which each students has an **extended assignment** and an **oral defence** of their home programme
- 3) 2 **paper-based** mid-terms exams

**Results:**

- **Same results for both groups** on lab work and on mid-term exam (slightly higher for Group 1 but not statistically significant)
- The ChatGPT group had the impression it had learnt more than the non-GPT group



## Example 2: Keeping same learning gains with or without LLM in computer programming course (Slovenia)

### How did it work?

- **Revised assignments:**
  - ♦ Instructors checked what ChatGPT does easily and provided assignments that are less convenient for ChatGPT or require more student knowledge for good prompting
  - ♦ Use Lab sessions to extend home assignments (with no help of ChatGPT)
- **Oral defence of produced computer programmes (with Teacher Assistants)**
  - ♦ Conceptual questions (explaining part of their programming code emphasising object-oriented concepts)
  - ♦ Code analysis (search in code for specific functionality)
  - ♦ Code changes questions (minimal change in the object-oriented part of the programs that change the code's behaviour)
  - ♦ Code completion questions (demonstration of using object-oriented code in the main program)
- **Mid-term exams**
  - ♦ Mainly based on theoretical questions
  - ♦ NB: Paper format annoyed students to some extent

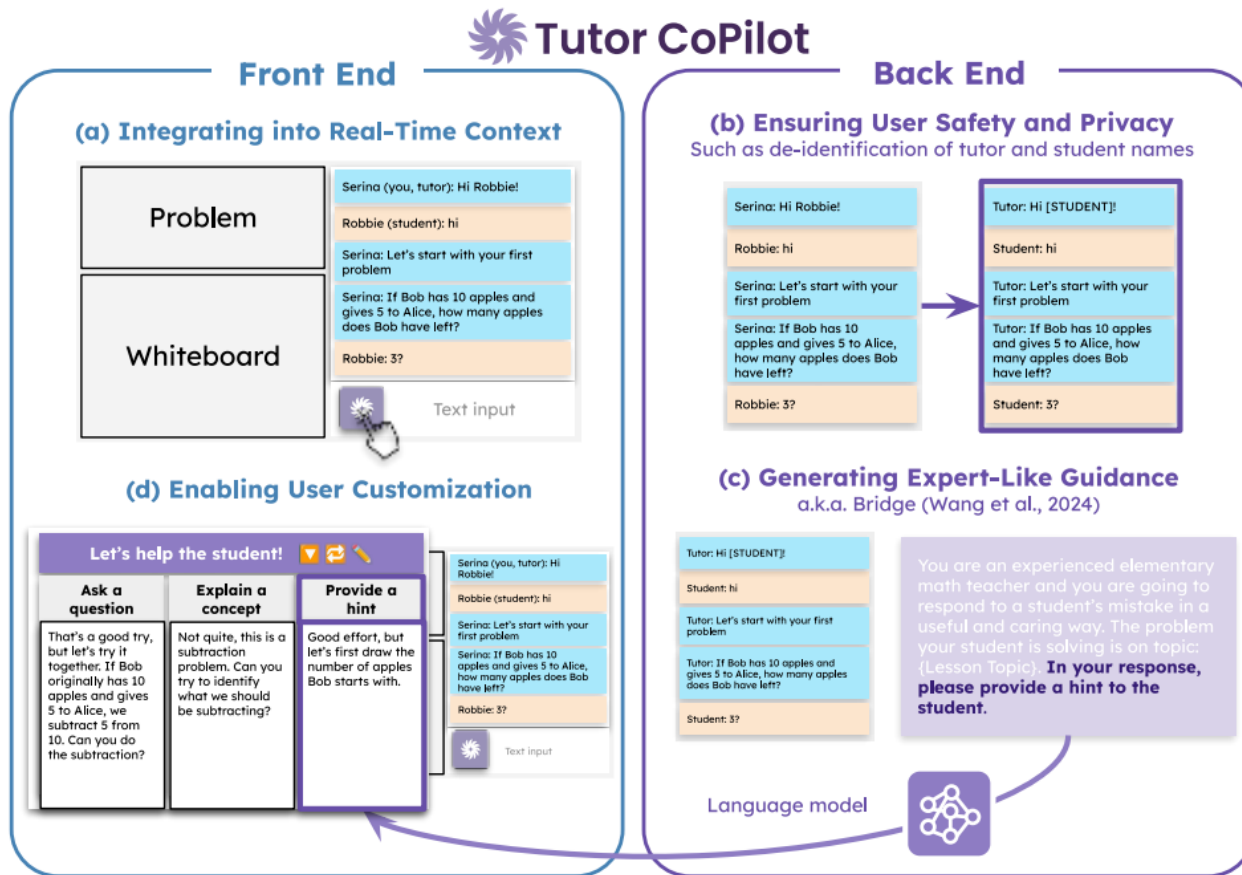


can educational GenAI improve learning?



# Example 1: Helping instructors in real time to provide feedback

## Tutor Copilot: a way to mobilise less qualified tutors effectively?



**Intervention:** More or less experienced and qualified human tutors use specifically trained AI chatbot in real time to support underserved pupils in the US in a virtual tutoring platform

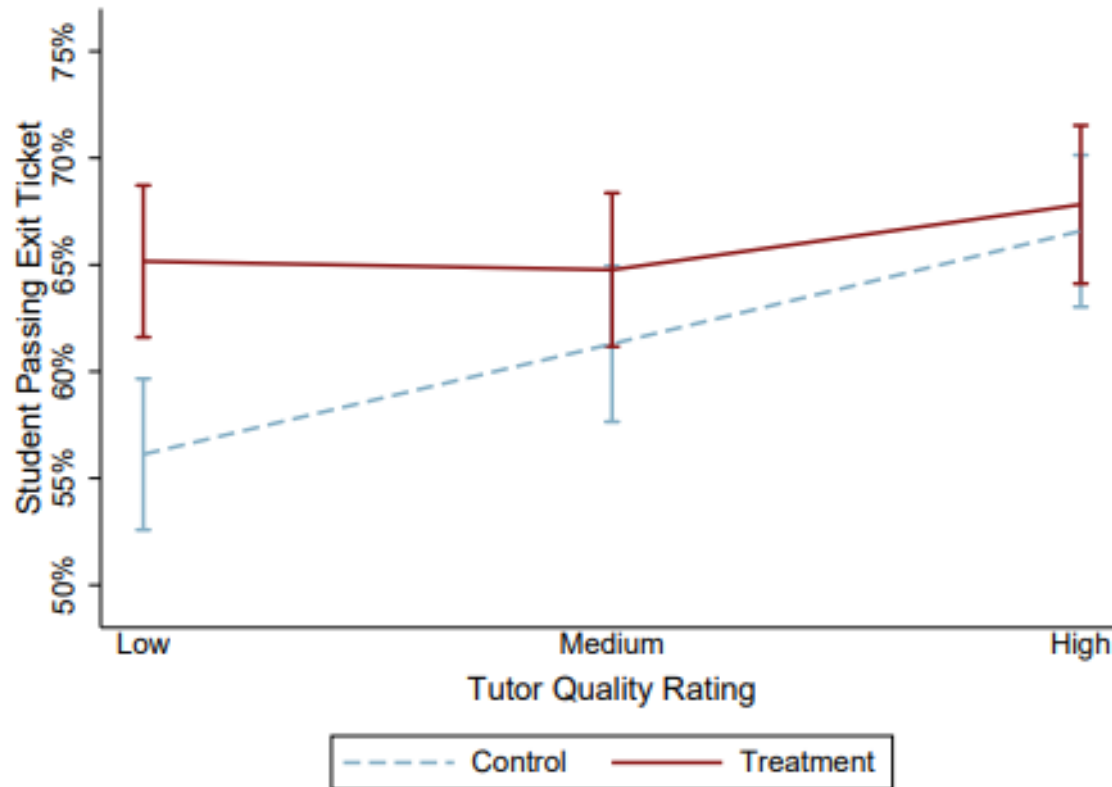
Machine is trained based on the ethnologic observation of good teachers providing feedback (and use GPT4)

Very robust study in K12 – possibly transferable to HE?



## Example 1: Helping instructors in real time to provide feedback

Tutor Copilot: a way to mobilise less qualified tutors effectively?



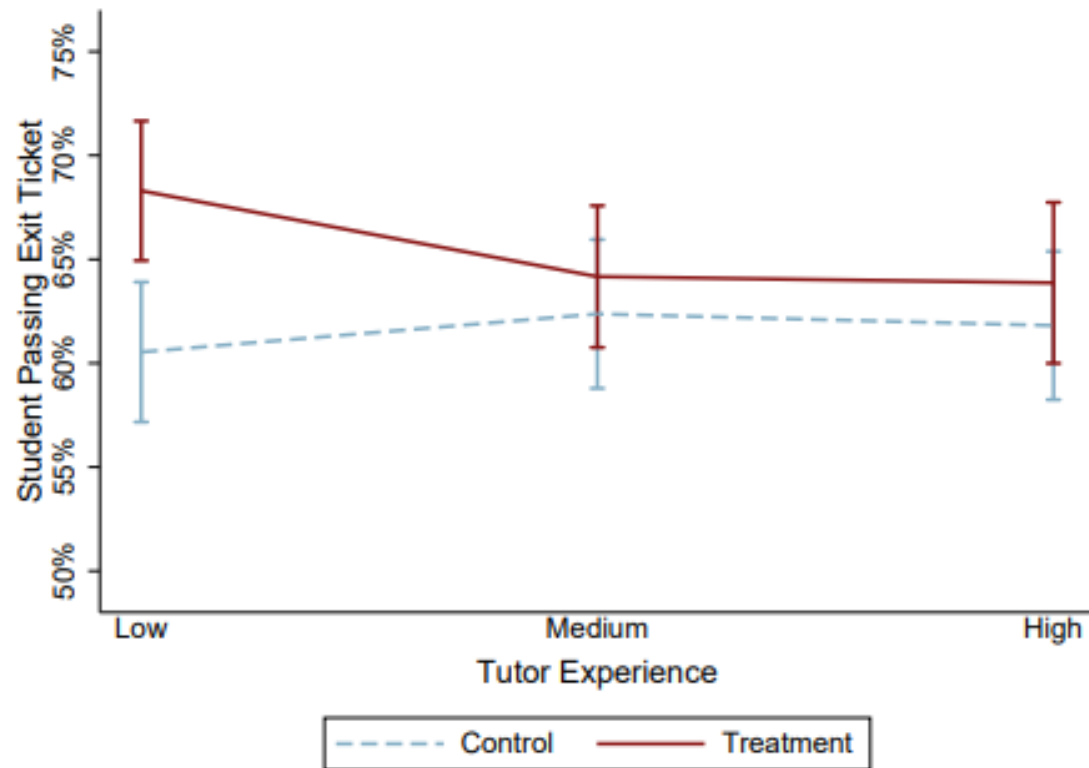
RCT shows effectiveness, particularly for « lower quality » (and less experienced) tutors

(a) Tutor Quality Rating



## Example 1: Helping instructors in real time to provide feedback

Tutor Copilot: a way to mobilise less qualified tutors effectively?



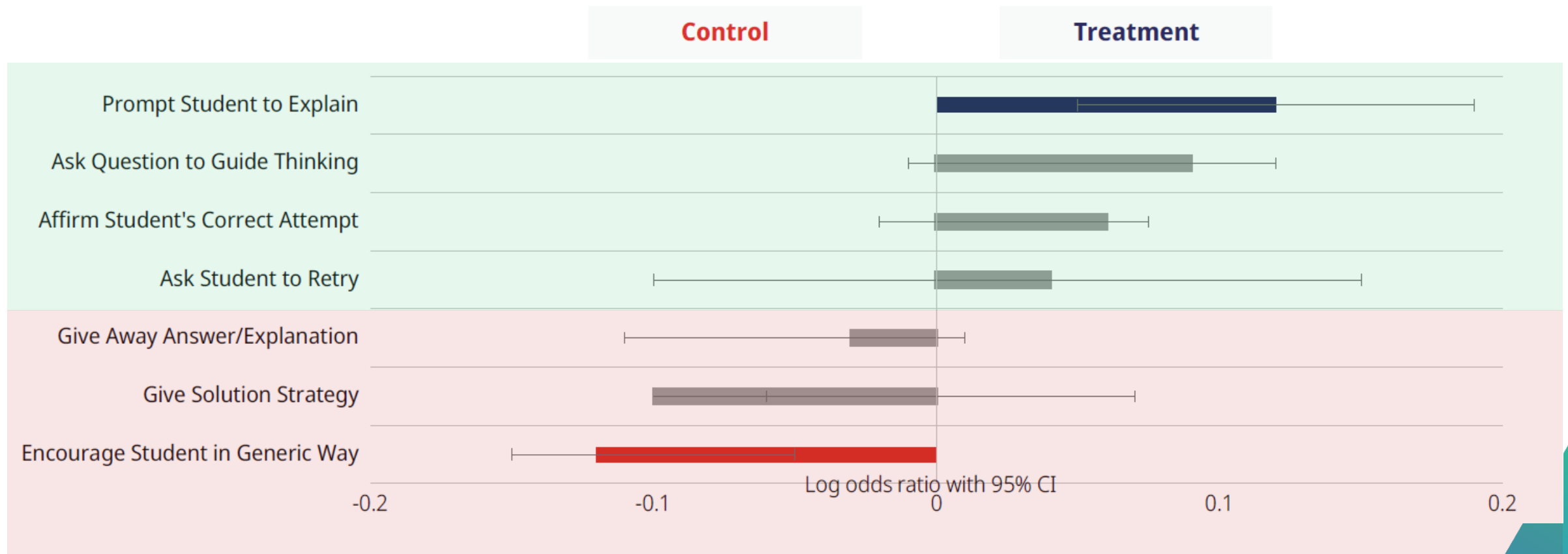
(b) Tutor Experience

RCT shows effectiveness, particularly for less experienced (and « lower quality ») tutors



## Example 1: Helping instructors in real time to provide feedback

How come? GenAI-assisted tutors used more active and effective teaching strategies.



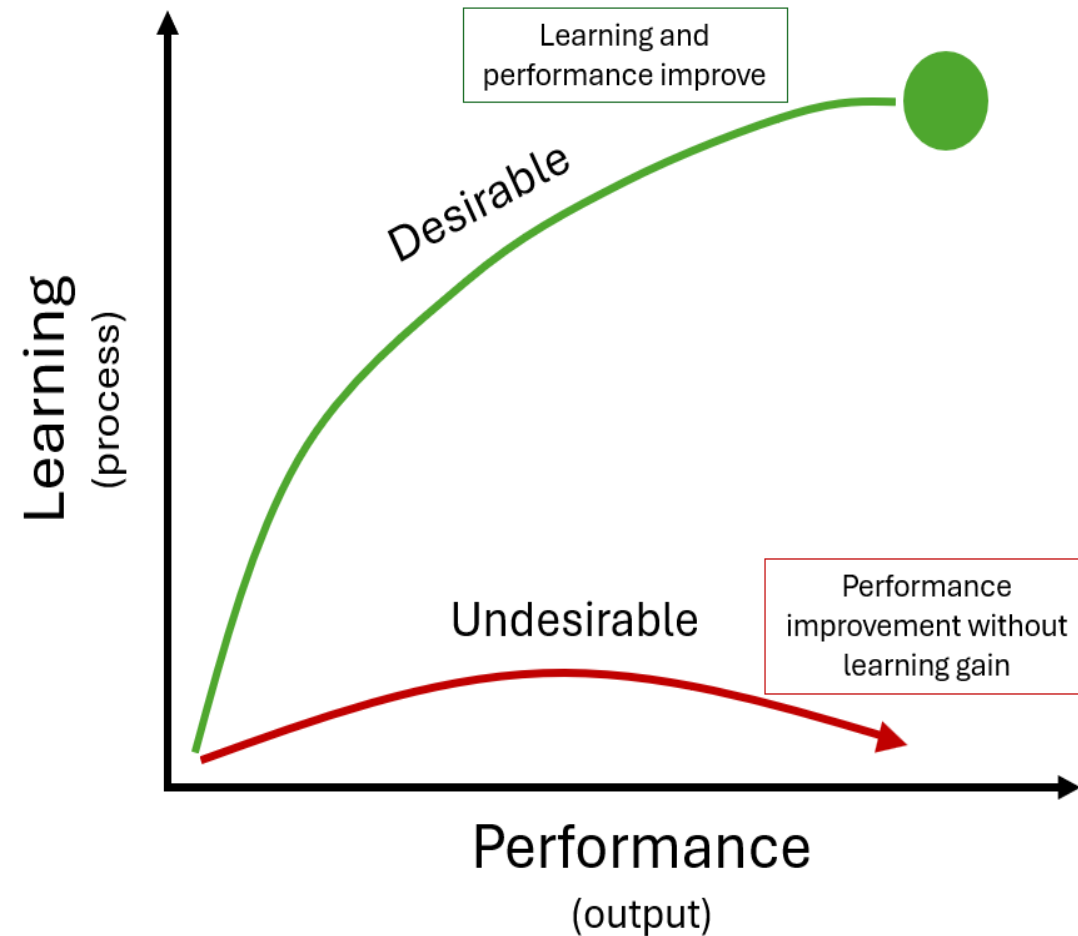


take aways



# What does it take to learn with GenAI?

Either integrating GenAI into learning.... or embedding learning into GenAI



- Use **general-purpose** GenAI tools as part of traditional pedagogies in ways that support learning, **under teacher guidance**
- **Redesign current pedagogies** so that the availability of **general-purpose** tools does not affect learning outcomes
- Pay attention to **learning processes** and not just outputs and emphasise **process-based assessment**
- Identify the course/subject foundational knowledge and skills and make sure they are acquired (without AI) → dual mode of learning and assessment (with and without GenAI)
- Develop **educational** GenAI tools aligned with pedagogical knowledge and educational research

**towards educational generative AI**



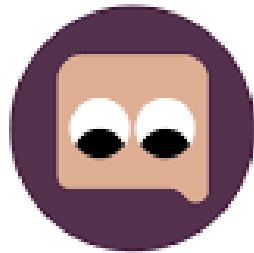


what does GenAI bring to traditional  
educational AI tools?

# Digital tutors/teaching assistants with GenAI chatbots

I can help you brainstorm classroom activities! Let's get started!

Let's encourage your students' joy of learning and growth mindsets together!



I'm Khanmigo, an AI-powered guide. I can help you achieve your teaching goals!

Quizzes! Games! Debates! And that's just the beginning.

This chat is logged. You can view in your [chat history](#).

In this activity, we'll talk about your class goals, and develop a humanities lesson plan together! What topic and grade level would like to focus on for this lesson?

[Leave feedback](#)

Rate this response



Creative writing for high school juniors

Oh, I'm thrilled to collaborate with you on a creative writing lesson for high school juniors! It's going to be a fantastic learning experience for your students!

Would you like me to start with a rough draft of the lesson plan, or do you want to provide more information to customize the lesson further?

[Leave feedback](#)

Rate this response



I'd like the lesson to focus on metaphors and similes.

Fantastic! Metaphors and similes are such powerful tools in creative writing. They can truly bring a piece to life!

Before I create a rough draft of the lesson plan, would you like to provide any more information, such as learning objectives, standards to be addressed, previous lessons on the subject, or the amount of time you have for the lesson? Or, would you prefer that I start with a rough draft based on the focus on metaphors and similes?

[Leave feedback](#)

Rate this response



35/70, 28/70, 30/70

Great job with the first and third fractions! However, I'd like to know how you got the equivalent fraction for  $\frac{4}{5}$  as  $\frac{28}{70}$ . Can you explain your thought process?

[Leave feedback](#)

Rate this response

Huh, I messed up, should be 56/70 instead

Now that we have the equivalent fractions  $\frac{35}{70}$ ,  $\frac{56}{70}$ , and  $\frac{30}{70}$ , we can add them together. Can you add the numerators and keep the common denominator of 70?

[Leave feedback](#)

Rate this response

131

You've added the numerators correctly! Now, let's put the sum of the numerators over the common denominator. What is the final fraction you get?

[Leave feedback](#)

Rate this response

131/70

Excellent! You've successfully added the fractions and arrived at the final answer,  $\frac{131}{70}$ . Well done! Do you have any other questions or problems you'd like to work on?

Type message (do NOT share any personal data)

[Clear chat](#)

Khanmigo makes mistakes sometimes. [Here's why.](#)



# Opportunities and challenges for GenAI pedagogical agents

Selected international evidence from the DEO 2026

## Opportunities

- > Conversational approach (flexibility)
- > Easily adaptable to multiple subjects
- > Capable of questioning, scaffolding, turn-taking techniques, providing feedback...
- > Personalisation to the specific challenges of an individual learner

## Challenges

- > Occasional errors (hallucinations) – some techniques help but it remains a feature of GenAI (and occasionally a problem for learning)
- > Balancing support/scaffold and dependence (over-reliance by student)
- > Making it engaging for students to learn



# Example of a GenAI tutor **shifting its scaffolding approach**

## The Socratic Playground - Example from the DEO 2026

*You are a new policy analyst at a foundation tasked with reviewing proposals for renewable energy subsidies. [...] Write an argumentative essay that outlines the pros and cons.*

**GenAI Tutor:** Hello, it's great to see you. [...] Let's start by outlining two reasons to **support** subsidies for renewable energy.

**Student B:** I think it should.

**GenAI Tutor:** Great opinion! What's one reason why you support subsidies?

**Student B:** I have no idea how this should be justified.

**GenAI Tutor:** No worries at all! Let's work on this together. One reason might be related to climate change – do you want to expand on that or think of another reason?

After being in questioning mode, the GenAI tutors shifts its pedagogical strategy and provides a first answer to start the discussion



how can GenAI best support teachers  
while preserving their agency?



## Some examples of GenAI applications **for teachers**

- Generation of lesson plans
- Contextualisation of lesson plans
- Support to provide more detailed feedback to students
- Support to generate exercises and assessments
- Support to score student work according to a rubric

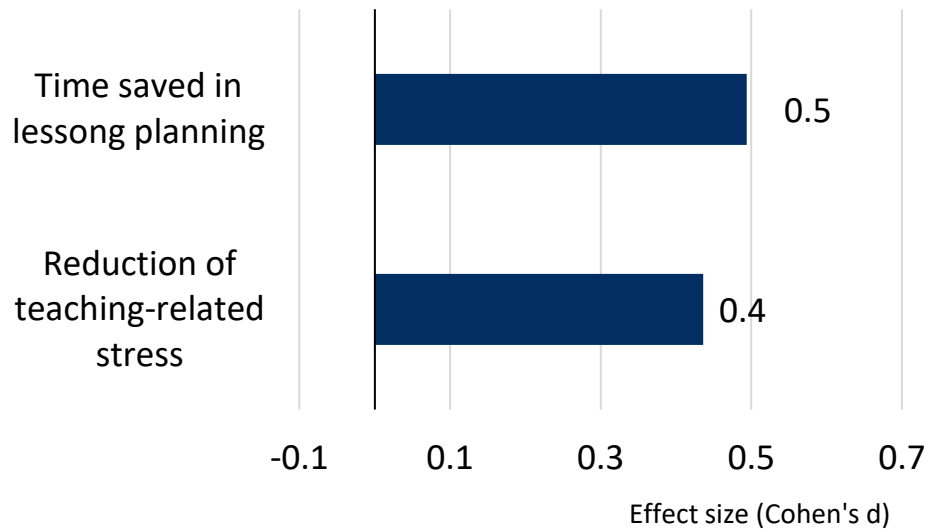


# GenAI as a productivity boost for teachers

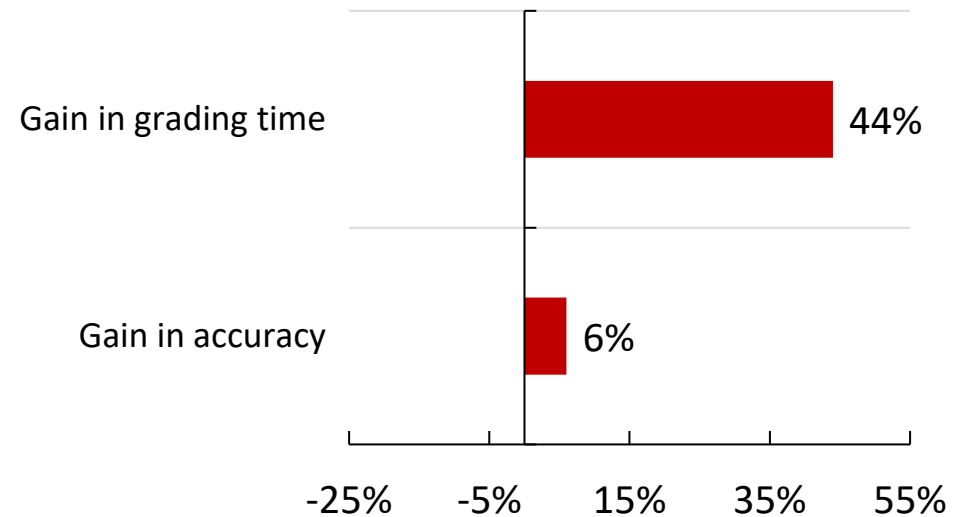
Selected international evidence from the DEO 2026

Comparing **GenAI** and humans in...

... preparing lessons



... grading a coding assignment



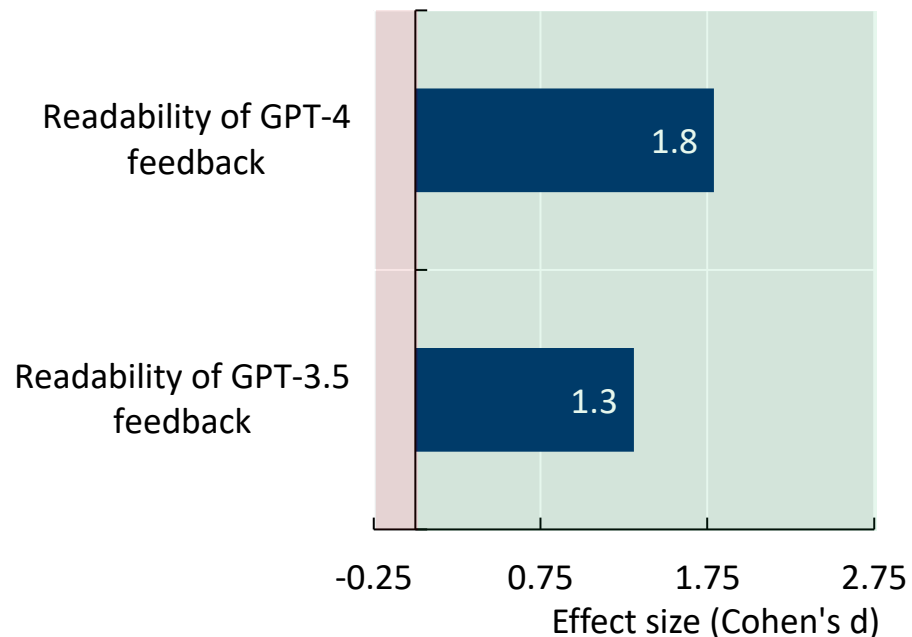
Though it also comes with risks to mitigate for teachers: cognitive offloading, loss of social interactions with students, halt to professional development, reduced agency and autonomy



# AI and the power of feedback - readability

## Selected international evidence from the DEO 2026

Comparing **GenAI's feedback readability** to humans'



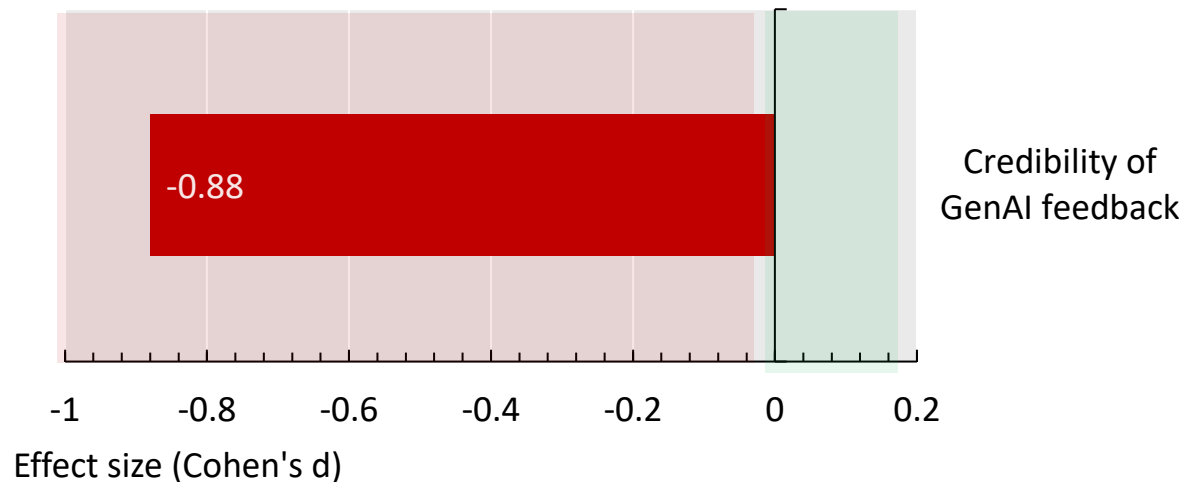
## Review of evidence

- > GenAI can scale timely and individualised formative feedback.
- > Evidence shows that **AI-generated feedback** can match or exceed human feedback in quality, readability, structure...
- > And can lead to similar learning gains for students.



# AI and the power of feedback - credibility

## Selected international evidence from the DEO 2026



### Review of evidence

- > Whatever its quality, feedback is only effective if taken seriously and acted upon
- > And students still tend to perceive GenAI feedback **less credible** and meaningful than humans', which decreases their motivation and engagement
- > Comparable quality of feedback does not imply pedagogical interchangeability
- > Thus, **hybrid AI-teacher** models are most promising

**5**

**Some country initiatives**





England

# ➤ Safety Expectations + AI Education content store

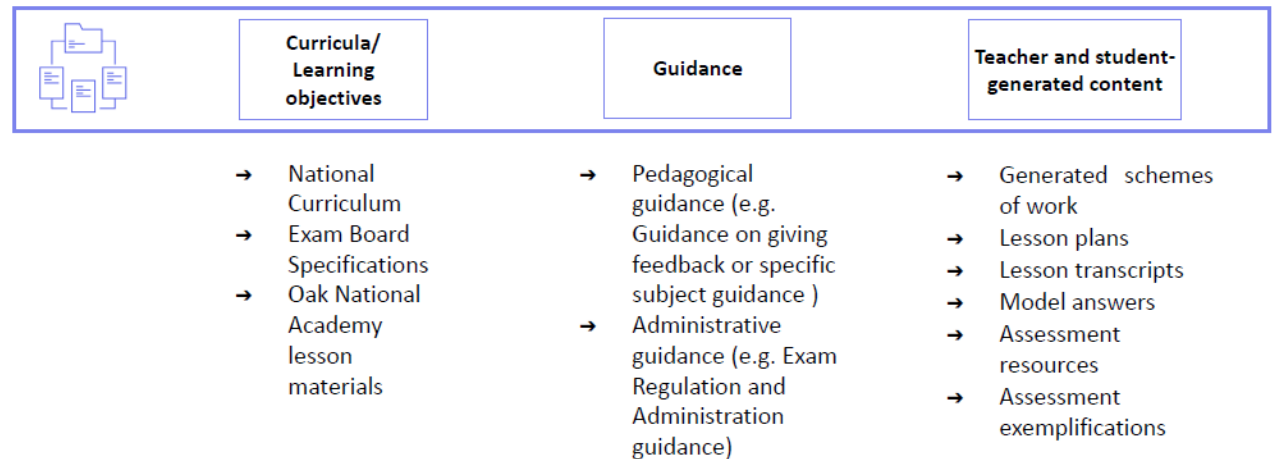
## AI Education Content Store

Enabling safe, impactful AI in the classroom through a unified Education Content Store



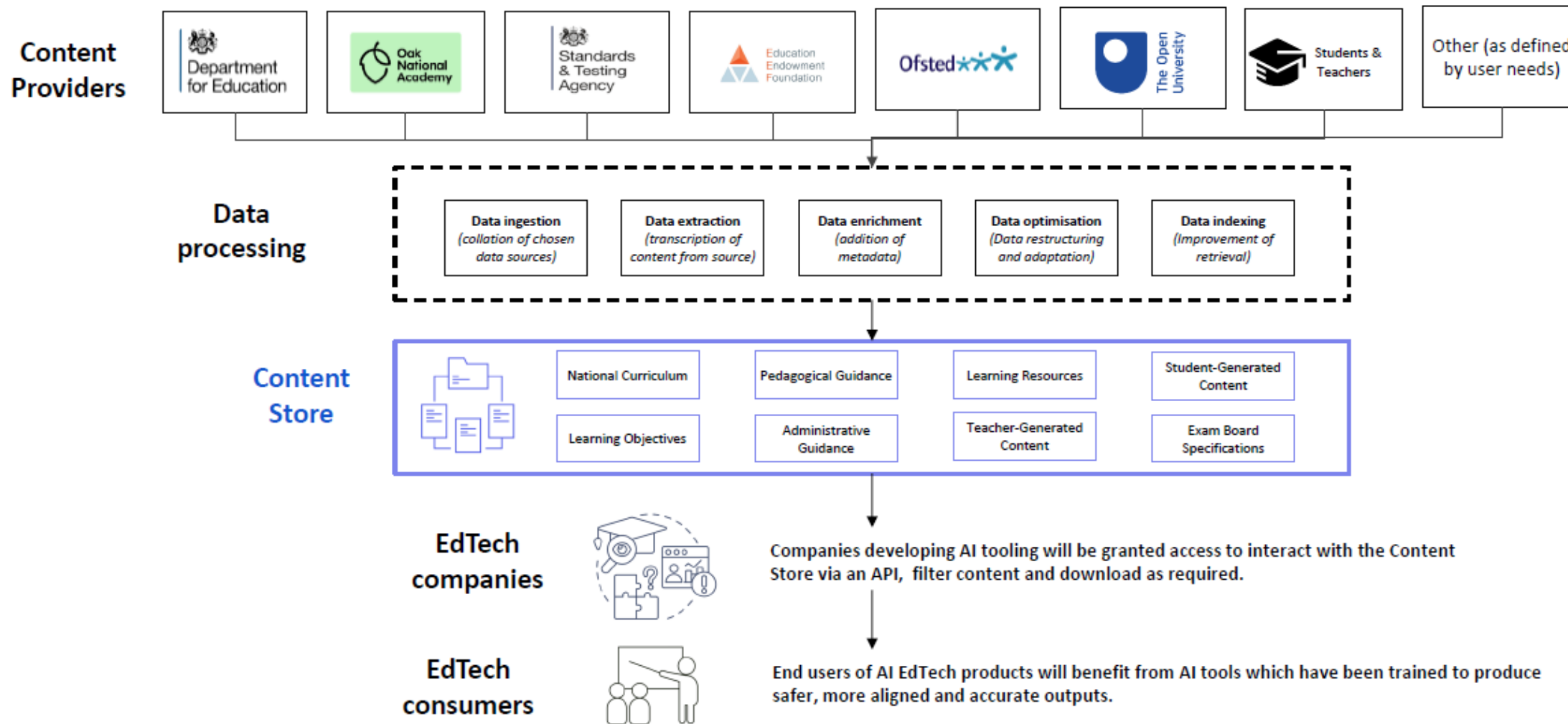
- **Product Safety Expectations for Generative AI in Education**
- The **AI Education Content Store** is a DfE/DSIT-led initiative, aiming to bring together a repository of curated and optimised materials to be used by EdTech companies to ensure their AI tools produce **safe, aligned, accurate content**

Content Store





# AI Education content store





France



# New measures for AI literacy and the use of GenAI in education

Ministère Système éducatif Enseignements Vie scolaire Métiers et ressources humaines Bulletin officiel Accès rapide



## INTELLIGENCE ARTIFICIELLE AU SERVICE DE L'ÉDUCATION : DES MESURES AMBITIEUSES POUR ACCOMPAGNER LES USAGES DES ÉLÈVES ET DES PROFESSEURS

Presse

Alors que se tiendra, les 10 et 11 février 2025, le Sommet pour l'action sur l'intelligence artificielle, Élisabeth Borne, ministre d'État, ministre de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche a présenté, ce vendredi 7 février, des mesures ambitieuses en matière d'intelligence artificielle pour l'éducation.

### UNE CHARTE POUR ENCADRER L'USAGE DE L'IA À L'ÉCOLE

Véritable outil au service de tous, l'intelligence artificielle bouleverse les habitudes et usages pédagogiques, mais également la manière d'apprendre et d'enseigner. Alors que la grande majorité des élèves et des étudiants utilisent aujourd'hui l'IA, moins de 20 % des professeurs s'en saisissent régulièrement dans leur pratique professionnelle. Il est donc impératif de les former et de les accompagner dans la prise en main de ces technologies pour les renforcer dans leur mission essentielle, en garantissant un usage raisonné et éthique de l'IA.

- A **charter** about the use of AI in school
- Development of a « **sovereign AI** » to support teachers (EUR 20M – lesson planning and student assessment)
- PIX – **extension of mandatory test on digital skills** (grades 8 and 10) to AI (and related training)
- Mainstreaming of an **administrative GenAI** to deal with general questions of 1.2 million teachers (and allow HRM staff to focus on individual cases)



Estonia



# AI Leap: rolling out GenAI tools for high school students

AI Leap

Presidential Hackathon About Study visit News Contacts ET

## Human intelligence alongside artificial

AI Leap is an Estonian educational innovation program helping schools adapt to the age of AI and fostering meaningful learning.

Delegating homework to machines is already common. Without intervention, the strongest would benefit from AI, but many students' critical thinking development would suffer.

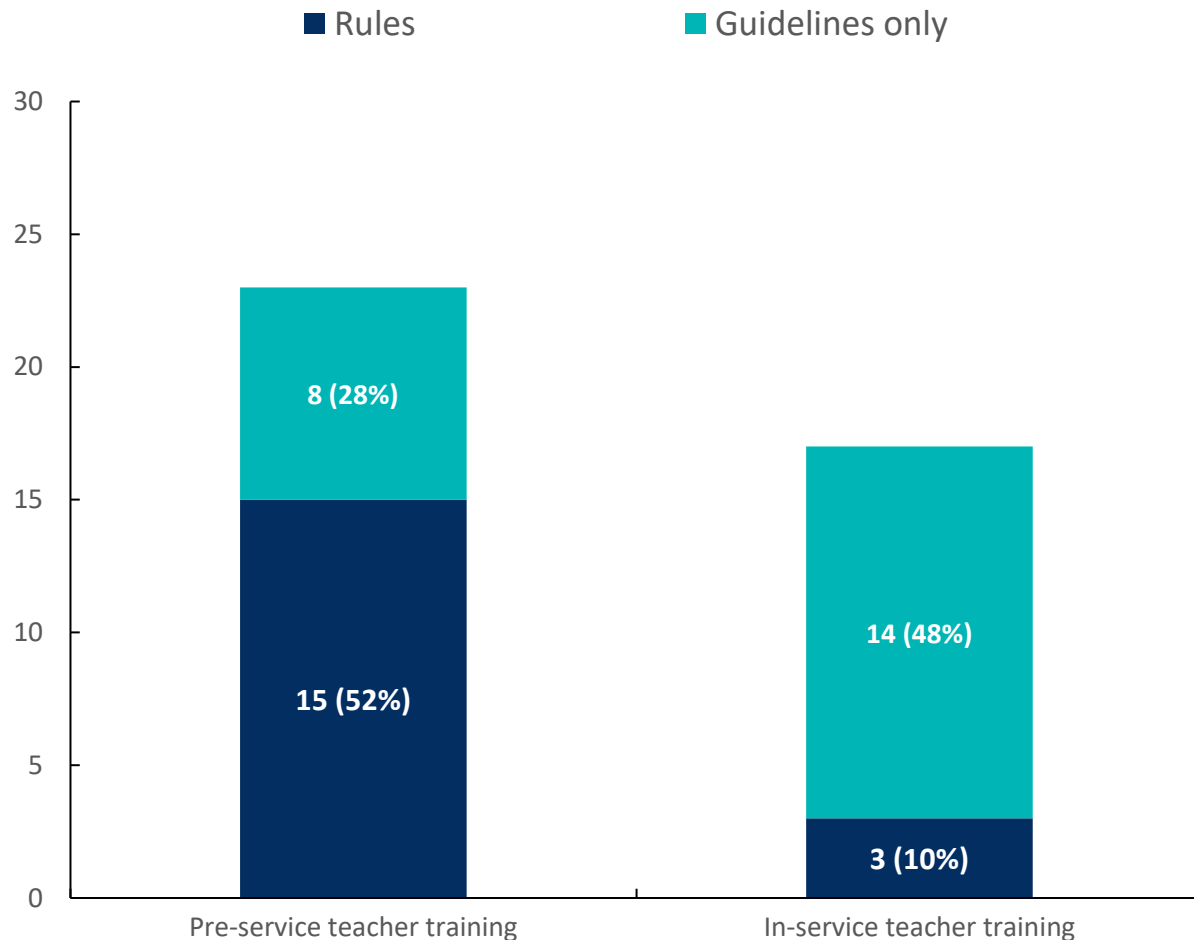
- Reviving the (past) Tiger Leap approach: a public-private-partnership agency outside of the Ministry bringing together a variety of competences
- All 10-11 grade high school students have access to **educational** GenAI tools in Estonian developed with Estonian education researchers
- All teachers have access to general-purpose GenAI tools
- A multi-level initiative:
  - ◆ Teacher programme (CPD)
  - ◆ Student programme (Hackatons, student voice)
  - ◆ Technology development
- Planned impact evaluation of the initiative



# AI literacy internationally



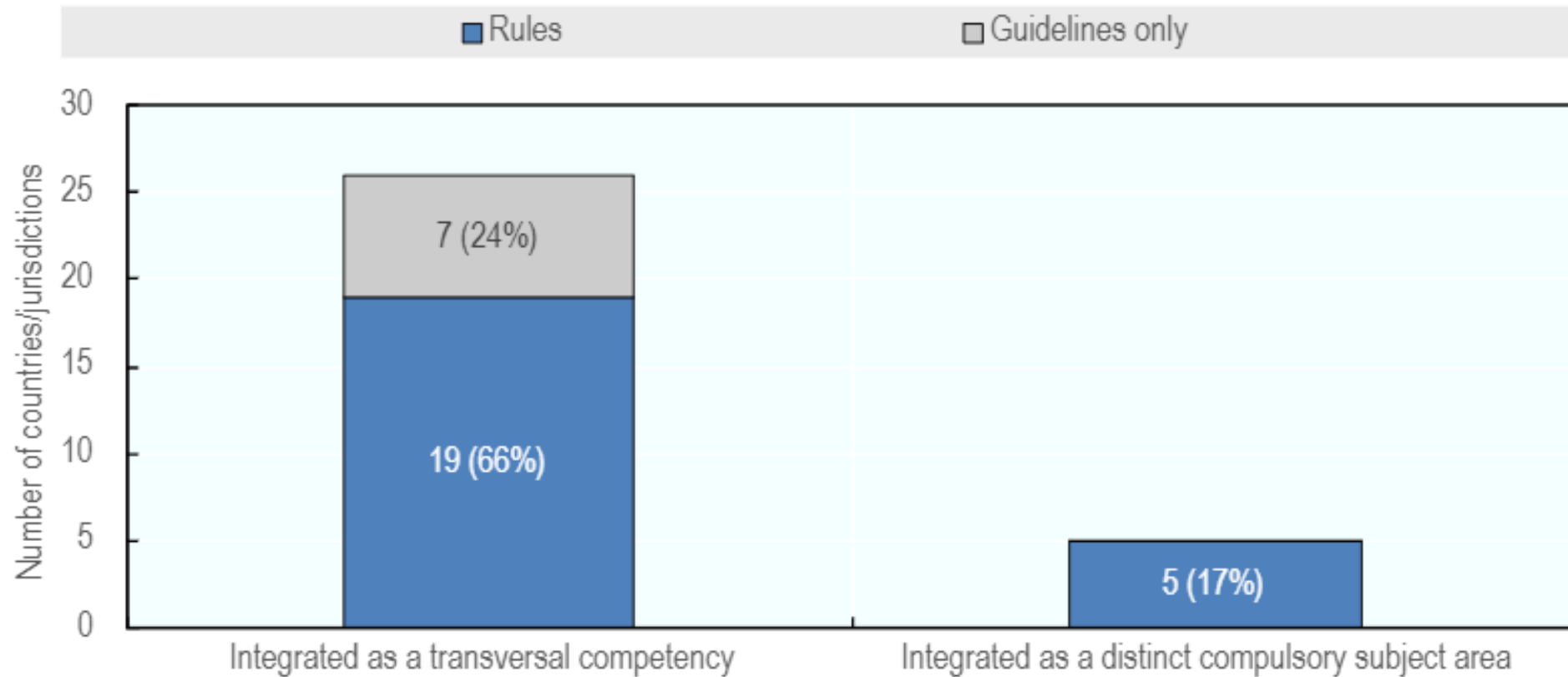
# Strengthen pre- and in-service pedagogical digital competencies of teachers



- Devolution of responsibility in many countries
- Standards for pre-service more frequent than for in-service
- Many other possible ways to incentivise and support teachers: curriculum, innovation projects, digital professional learning communities



# In most countries, all teachers are responsible for students' digital competences

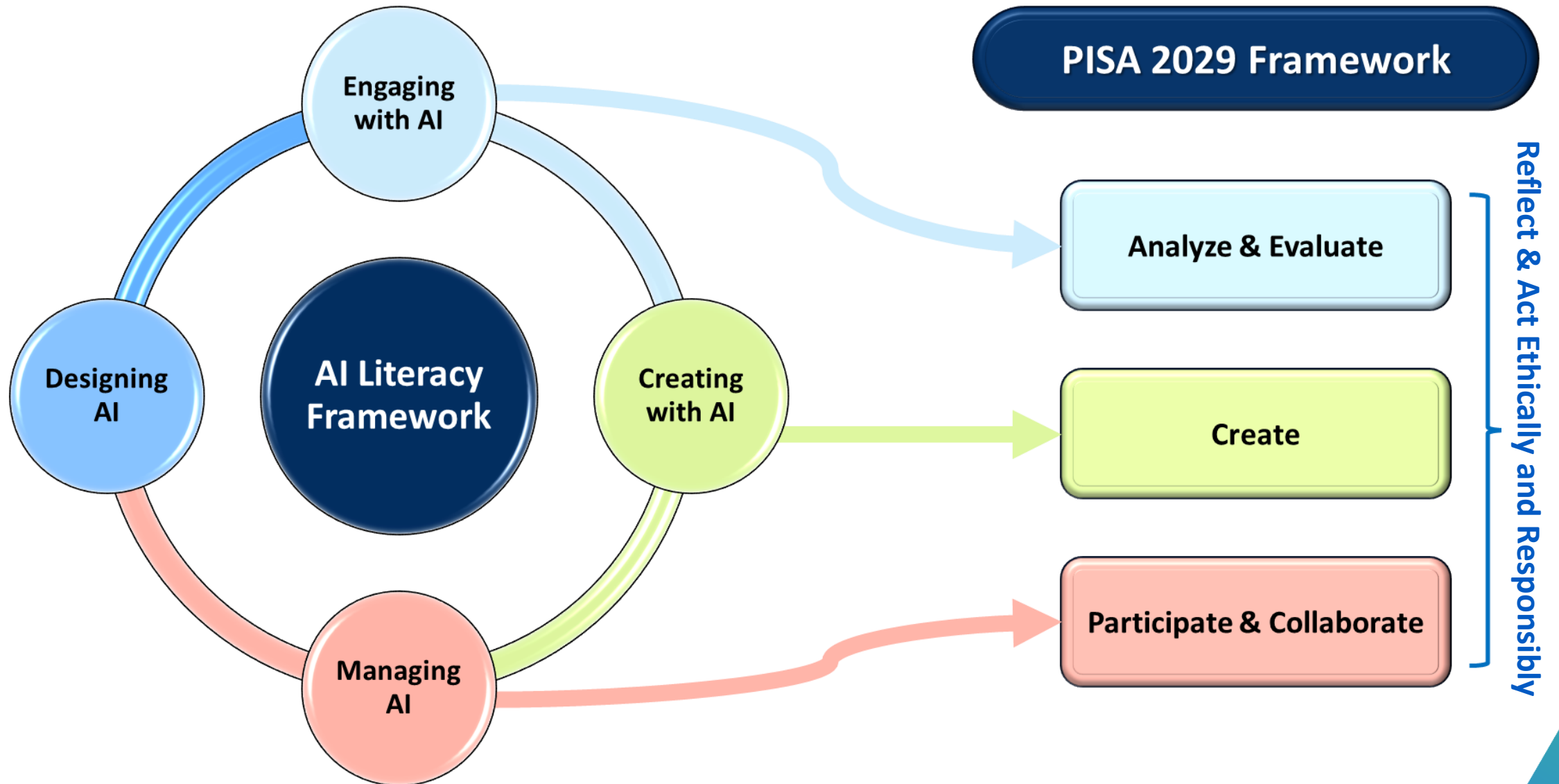


26 out of 29  
countries/systems





# EC-OECD AI Literacy Framework and PISA 2029 MAIL Framework

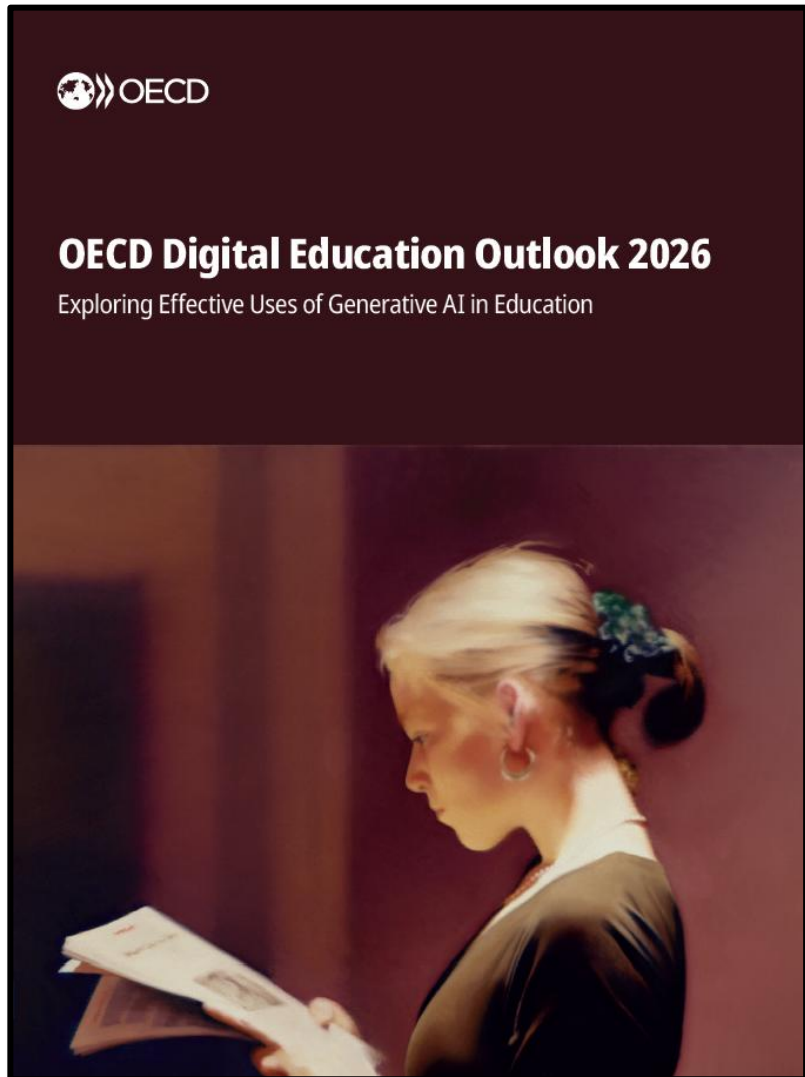


**5**

**concluding remarks**



# The OECD Digital Education Outlook 2026 – Main findings



- **General-purpose GenAI :**
  - may NOT lead to learning despite enhanced student performance
  - may lead to learning when used with clear pedagogical purpose
  - May lead to learning when pedagogy is redesigned to adapt to its availability at home
- **Educational GenAI** show promising developments to support students' learning and teachers' pedagogical practices while keeping their autonomy and agency
- Even when GenAI equals/surpasses humans at some tasks (e.g. feedback), it may not have the social impact that humans would have and substitution should be carefully examined
- Research is still emerging and needs to be strengthened



# What does this mean for education?

- Become clearer about **fundamental knowledge** in a course/discipline are: what should students know to be able to « correct » and interact properly with a GenAI?
- Have **dual modes of teaching/learning/assessing**: with no GenAI (closed book) and with AI (open book)?
- Review **assessment formats**?
  - ◆ Paper and pencil exams
  - ◆ Digital exams with proctoring (no AI or how is the AI used)?
  - ◆ Oral examinations and video submissions
  - ◆ Design home assignments where GenAI allows to ask for more
- Prepare Master's and PhD students to **use and develop specialised GenAI research tools** (and sensitising others to new scientific processes when relevant)



# Different types of AI in education

- GenAI tools are AI systems that:
  - ◆ **create new outputs** (e.g., text, code, audio, images, video),
  - ◆ often in response to prompts,
  - ◆ based on their **training data**
- GenAI is **widely accessible** and used **outside institutional control** by students, teachers and researchers
- 2 types of GenAI: **general-purpose** and **educational**

## General-Purpose

Translation software  
Speech to text, Text to speech  
(essential for assistive technologies)

## Educational

Intelligent tutoring systems  
Early warning systems

**Large-language models**  
(LLMs), not mostly designed to support student's learning  
e.g. ChatGPT, CoPilot, Gemini, etc.

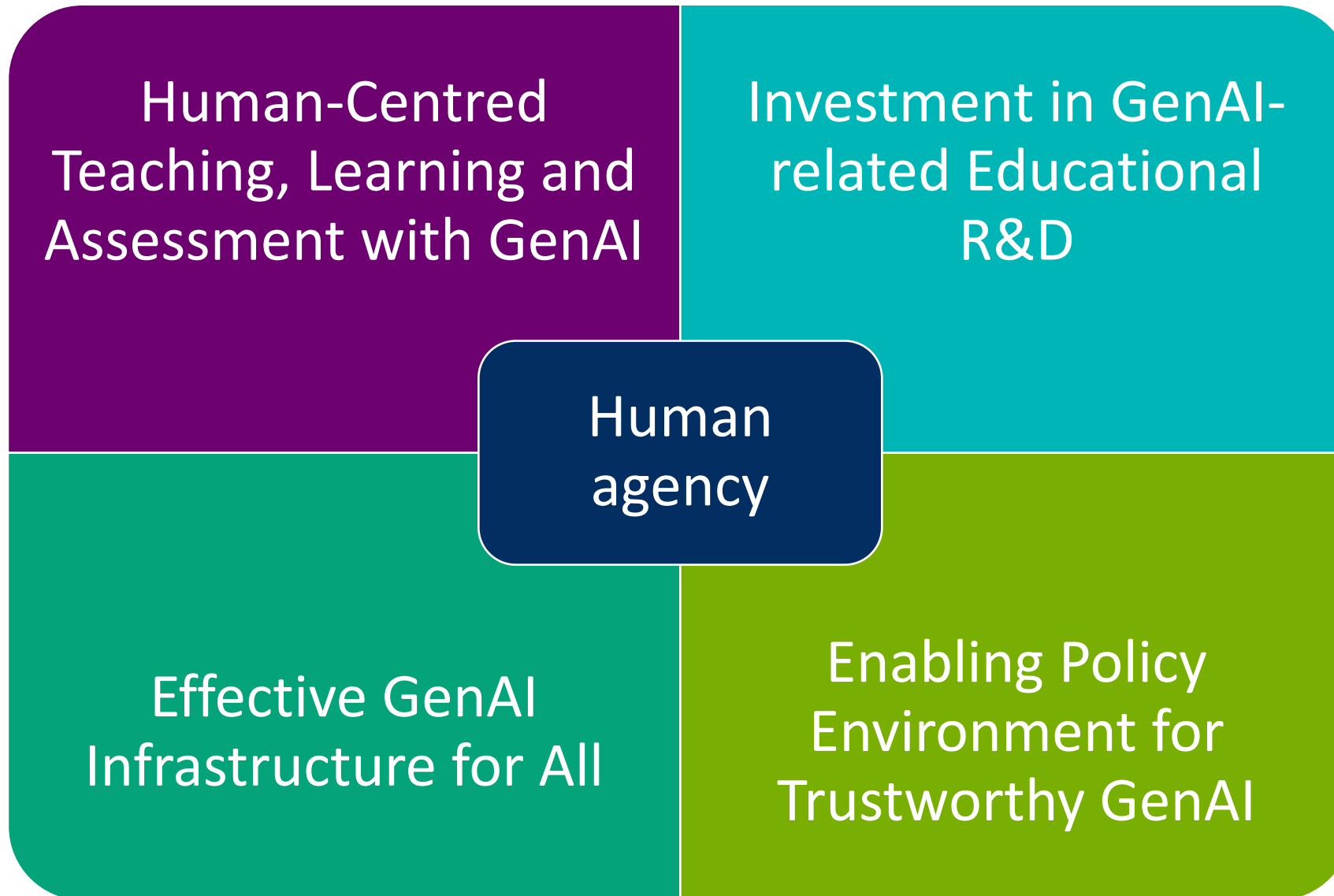
**LLMs developed for education purposes**  
e.g. Khanmigo, Socratic Playground, etc.

**Non-generative**  
(Predictive)

**Generative**



# OECD Insights for GenAI in Education





## Harnessing GenAI for education while mitigating risks for learning Human-Centred Teaching, Learning and Assessment with GenAI

1

- **Doing a task with GenAI isn't the same as learning from it**

2

- **As machines get smarter, human skills matter more.**

3

- **Students must learn to think** (without GenAI) **before they learn to prompt.**

4

- **GenAI works best when teachers design the task.**

5

- **No GenAI lesson plan replaces professional judgment.**

6

- **Algorithms may suggest; teachers must decide. Teachers should not outsource assessment to AI.**



## Better understanding how GenAI can be educational

### Investing in GenAI Research and Development for Education

7

- **EdTech should build GenAI for classrooms, not just consumer markets.**

8

- **If it isn't tested for safety, bias, and impact, it isn't ready for schools.**

9

- **The strongest GenAI will be co-designed with teachers and learners.**

10

- **We need global yardsticks—and serious research—to measure what GenAI actually changes in learning.**

11

- **Universities should train GenAI builders, not just GenAI users**



## Shaping an Enabling Policy Environment for Trustworthy GenAI

12

- **Black-box AI has no place in education.**

13

- **AI safety and standards demand global cooperation.**

14

- **Responsible GenAI use requires continuous guidance.**

15

- **Every AI decision must be open to human challenge.**



## Adding GenAI tools to countries' digital education infrastructure

### Supporting an Effective GenAI Infrastructure for all

16

- **No devices, no connectivity—no AI learning.**

17

- **GenAI belongs alongside other digital resources and textbooks as a core learning tool.**

18

- **Teachers need ongoing AI literacy, not one-off training.**

19

- **GenAI should empower teachers, not watch them.**



# Working together internationally





# Read the OECD Digital Education Outlook 2026



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