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# Teaching like Socrates

The timeless art of  
questioning for fostering  
creative thinking in the AI era

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Policy and Data Analyst

Greek National Documentation Centre

*CELDA 2024*

*26 October 2024, Zagreb*

**The main settings in  
compulsory education  
have remained almost the  
same...**



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Photo by [National Cancer Institute](#) on [Unsplash](#)

**Also in higher education,  
training and lifelong  
learning...**



Photo by [Juli Kosolapova](#) on [Unsplash](#)

**There are islands of  
innovation...**

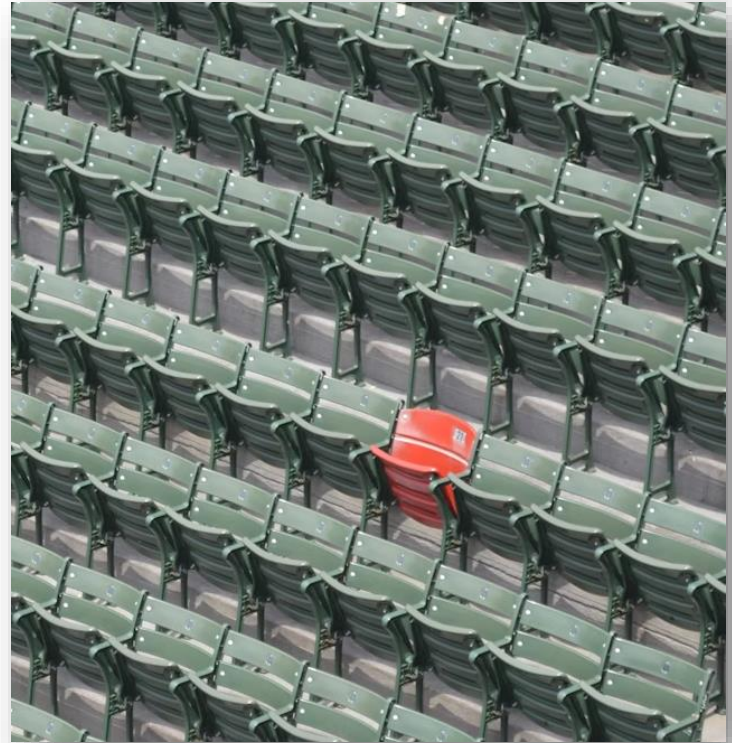
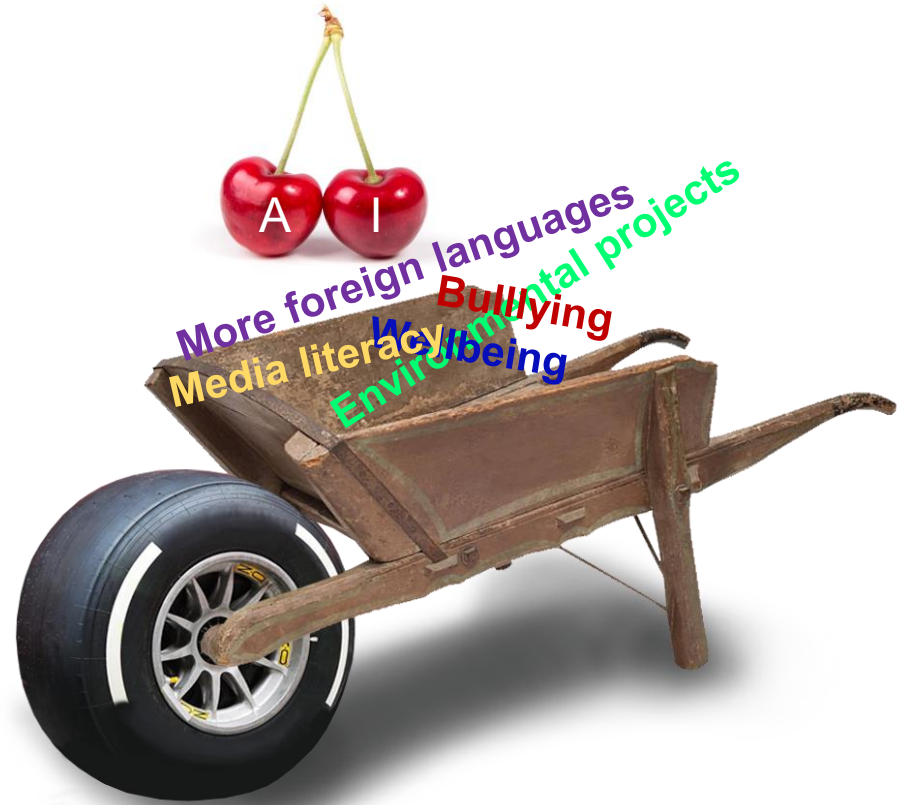


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But also a “curriculum  
overload (OECD, 2020)

[https://www.oecd-ilibrary.org/education/curriculum-overload\\_3081ceca-en](https://www.oecd-ilibrary.org/education/curriculum-overload_3081ceca-en)



**Education, training and lifelong learning still focus on preparing learners for providing the “right answers”**

**A paradigm shift is needed...**



# Who am I

# I am a lifelong learner and creative worker...

## Researcher, policy analyst, project and team leader



2012-2020



2021-2023



ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ  
UNIVERSITY OF PIRAEUS

2022-present



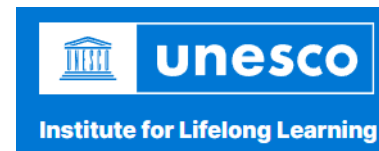
2022-present

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## Expert and consultant



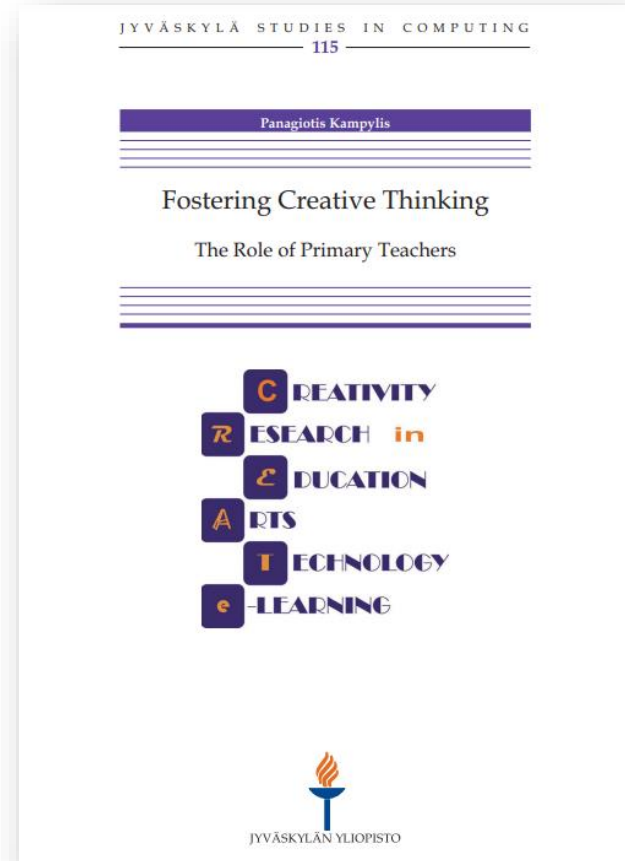
...



**And teacher, trainer and lecturer since... long time ago!**

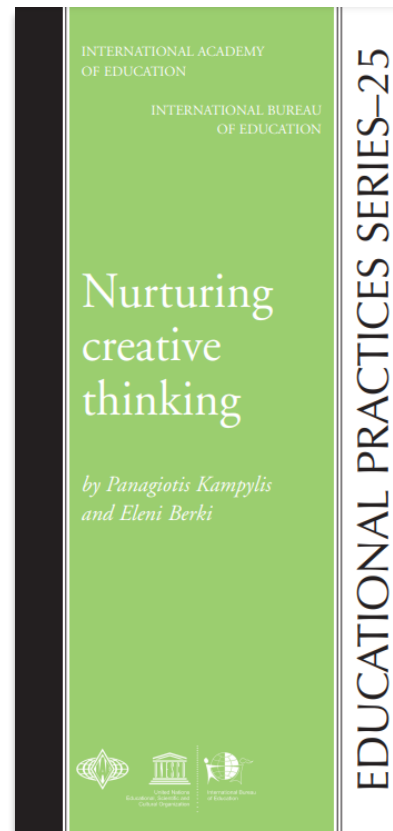


# My PhD research on creativity



<https://jyx.jyu.fi/handle/123456789/24835>

# 8 key principles for fostering creative thinking



<https://bit.ly/48eiZx5>

🔗 [ελληνική](#), 🔗 [Português](#), 🔗 [العربية](#), 🔗 [Suomi](#), 🔗 [Svenska](#)

# Revisiting two of them

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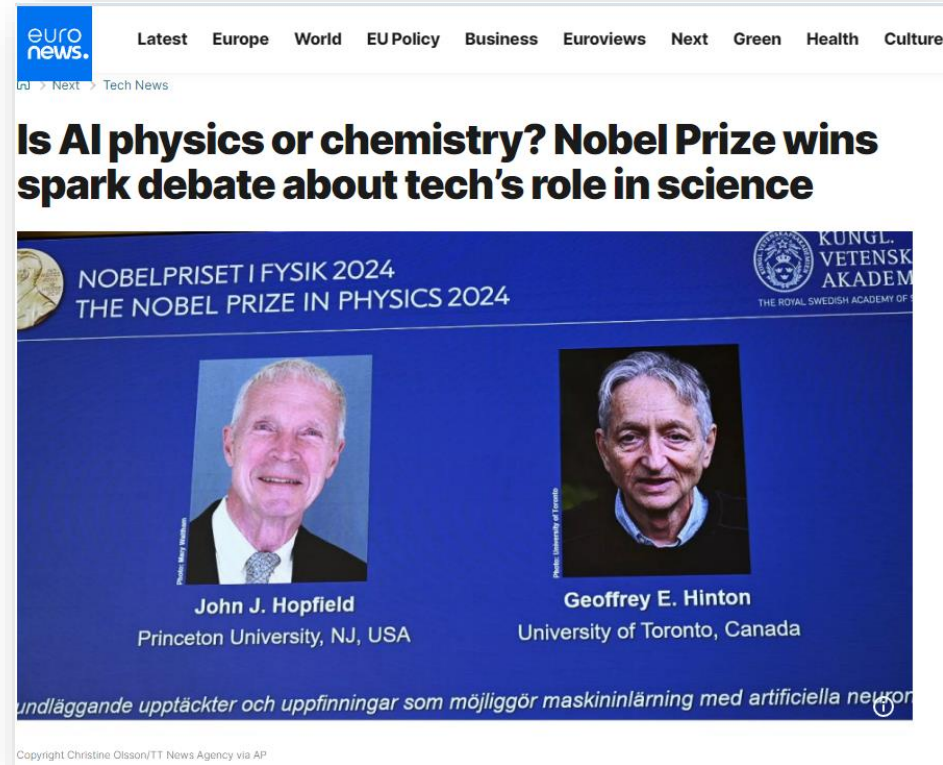
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# The AI era

# Physics and Chemistry Nobel Prizes 2024 to AI scientists!



<https://bit.ly/3Um2OcR>

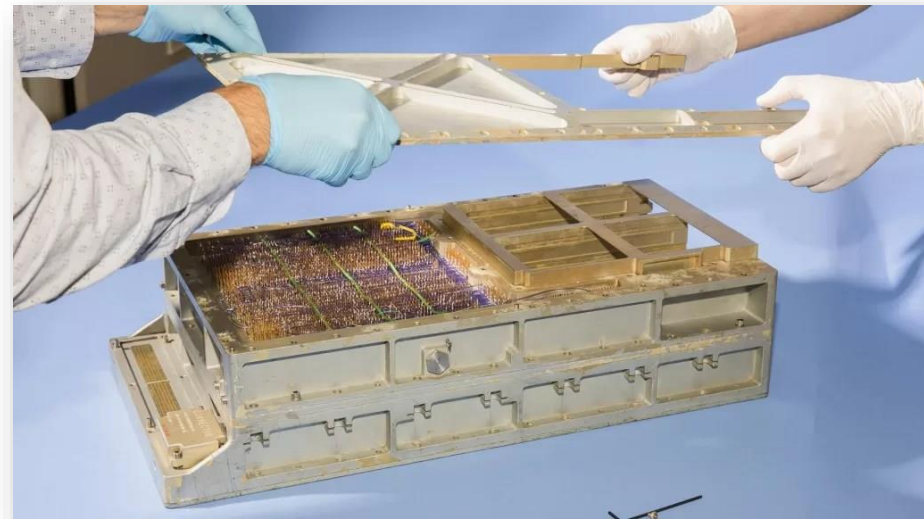
**It is the first time in the history of homo Sapiens that our evolution lies not within our genes but our technology, as we augment our brains (and bodies) with silicon and steel...**



Photo by [Henk Mul](#) on [Unsplash](#)

# Nowadays, we have extraordinary access to information and knowledge

A modern smartphone is approx. 120 million times faster than the computer that took humanity to the Moon! Without counting the wearables, etc.

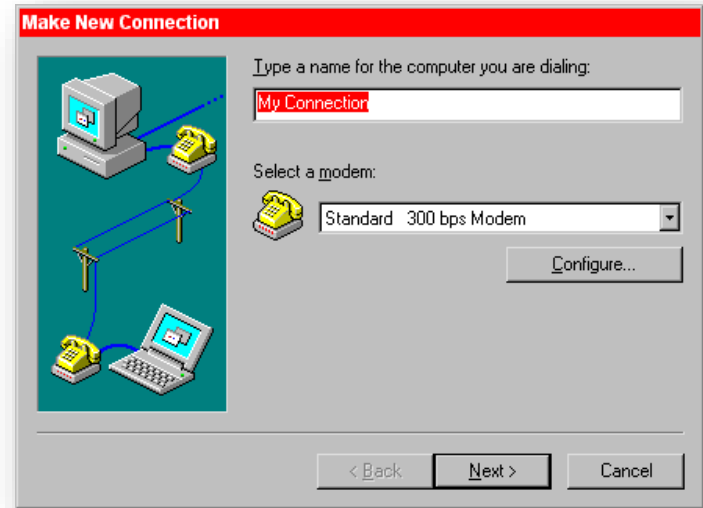


Comparison Table: Apollo 11 Guidance Computer vs Modern Smartphone

Feature	Apollo 11 Guidance Computer	Modern Smartphone
Clock Speed	0.043 MHz	3.23 GHz (Approx. 120 million times faster)
Weight	70 pounds	5 ounces
Size	1 cubic foot	Fits in your hand
Memory	64KB	64GB (1 million times greater)
CPU Speed	1.024 MHz	Clocked in gigahertz (Approx. 3,200 times faster)

<https://apollo11space.com/mobile-phone-vs-apollo-11s-guidance-computer/>

Do you remember the excitement of connecting to the WWW back in the 90s?





I feel the same  
excitement! But also a  
preoccupation!

Harvard  
Business  
Review

---

AI And Machine Learning

## AI's Trust Problem

by Bhaskar Chakravorti

May 3, 2024

**With tens of billions invested in AI** last year and leading players such as OpenAI looking for [trillions more](#), **the tech industry is racing to add to the pileup of generative AI models.**

The goal is to steadily demonstrate better performance and, in doing so, close the gap between what humans can do and what can be accomplished with AI.

<https://hbr.org/2024/05/ais-trust-problem>

I feel the same  
excitement! But also a  
preoccupation!

## AI's Trust Problem

by Bhaskar Chakravorti

May 3, 2024

Key regulations, such as the EU AI Act will [enforce certain transparency standards](#), but the ever-present challenge is that **the incentives for the AI companies encourage them to minimize transparency** — to preserve competitive advantage and intellectual property, and to prevent malicious hacks, and reduce exposure to [lawsuits about copyright](#). As such, **AI is often a black box — it isn't clear why it produces the output it does.**

**There is an AI hype but  
also critical voices!**

**The New York Times**

**OPINION**  
GUEST ESSAY

# Press Pause on the Silicon Valley Hype Machine

May 15, 2024

<https://www.nytimes.com/2024/05/15/opinion/artificial-intelligence-ai-openai-chatgpt-overrated-hype.html>

Can we control this power?



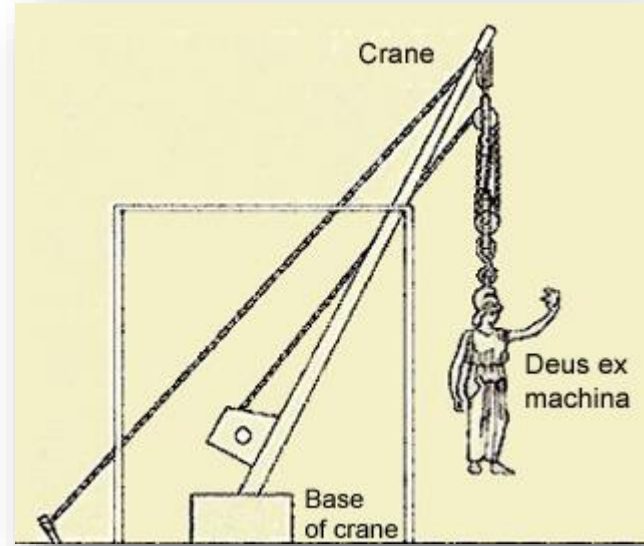
Chariot of the sun-god, Athenian red-figure krater  
C5th B.C., [British Museum](https://www.britishmuseum.org)

# The risks of playing with magic



From Disney's The Sorcerer's Apprentice

No Deus ex machina  
this time, we are alone!



Deus Ex Machina, or “God from the Machine” ending, is basically **when the author writes himself into a corner and pulls something out of his butt to resolve the story.**

<https://www.onelowerlight.com/writing/trope-tuesday-deus-ex-machina/>

**Philosophy is again on  
demand...**

# Many (philosophical) questions emerge...



Absolutely, here are some thought-provoking philosophical questions on AI that delve into ethics, consciousness, society, and the nature of intelligence:

## 1. Ethics and Morality

- Should AI have ethical obligations to humanity, and if so, what should they be?
- Can an AI system possess a sense of morality, or does true moral agency require human consciousness?
- What moral responsibility do developers and companies have for the actions taken by AI?
- Should AI have rights, and if so, under what circumstances would it be justifiable to assign rights to a machine?

## 2. Consciousness and Personhood

- Can AI ever achieve consciousness, or is consciousness inherently human and biological?
- If AI achieves a level of consciousness, should it be considered a "person" with legal rights and protections?
- What does it mean to be "intelligent," and does AI's intelligence make it fundamentally different from other human-made tools?

## 3. Human Identity and Society

- How does the increasing integration of AI into daily life change our understanding of human identity and individuality?
- Could reliance on AI for decision-making erode human capacities, like critical thinking or emotional resilience?
- In a world with advanced AI, what unique roles or qualities remain distinctly human, if any?

## 4. Responsibility and Accountability

- Who should be held accountable for an AI's actions—its creators, users, or the AI itself?
- In the case of AI mistakes or unintended harm, how should justice be served, and who should bear responsibility?



**Philosophy is for all!**

**Questions are at the  
core of philosophy**



[https://commons.wikimedia.org/wiki/  
File:Raphael\\_School\\_of\\_Athens.jpg](https://commons.wikimedia.org/wiki/File:Raphael_School_of_Athens.jpg)

**We must prepare 21st-century teachers and learners to ask (open-ended) questions**



Photo by [Artem Maltsev](#) on [Unsplash](#)

# Both to other humans and to IAs



Photo by [Christina @ wocintechchat.com](#) on [Unsplash](#)



Photo by [Emiliano Vittoriosi](#) on [Unsplash](#)

# Socratic questioning, a 2500-year-old approach to inquiry is still valid and useful!

Socratic questioning key attributes:

1. Concise, directed, and clear
2. Open, yet with purpose
3. Focused but tentative
4. Neutral

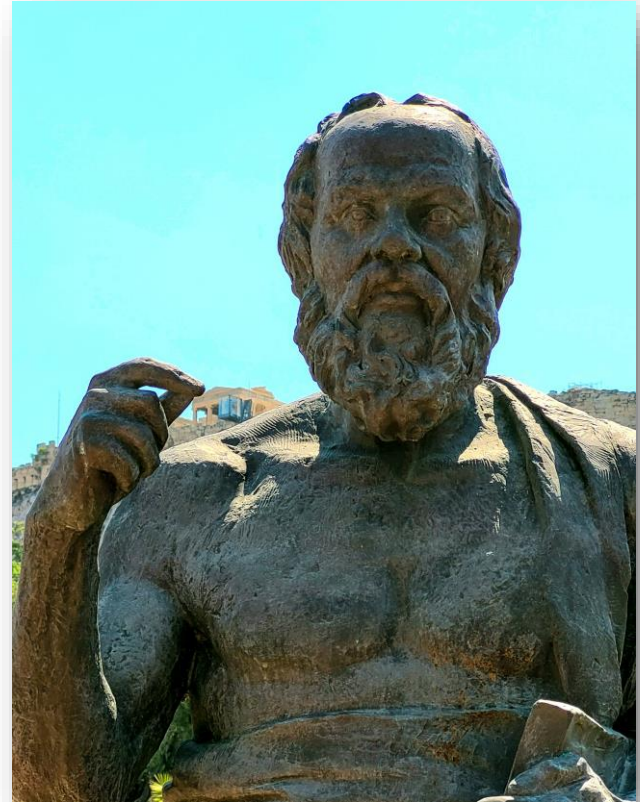


Photo by [Felipe Pérez Lamana](#) on [Unsplash](#)

# Main question types

## **Clarification questions**

What do you mean by...?

## **Assumption questions**

How can you verify or disapprove that assumption?

## **Probing questions**

By what reasoning did you come to that conclusion?

## **Implication questions**

What are the consequences of that assumption?

## **Viewpoint questions**

How would other groups of people respond and why?

## **Questioning the question**

Why do you think I asked this question?

**Creativity is needed more  
than ever...**

# Creative thinking assessment in PISA

#125

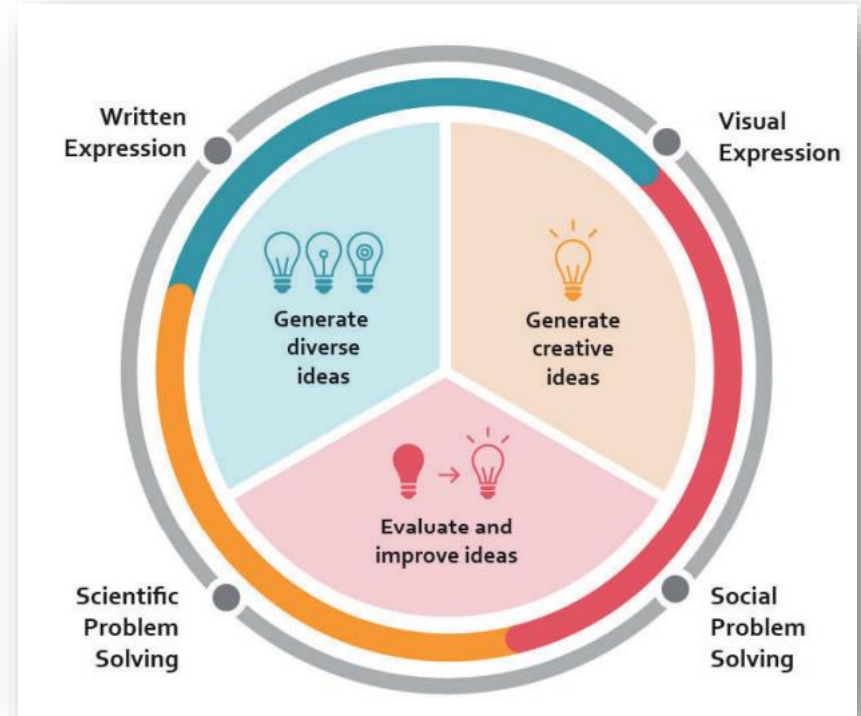


New PISA results on  
Creative Thinking: can  
students think outside the  
box?

Programme for International Student Assessment

<https://bit.ly/3YkFCwD>

# How PISA measures creative thinking?



<https://bit.ly/3YkFCwD>



**A simple (and  
provocative) definition  
of creativity**

**Creativity is like murder –  
both depend on motive,  
means, and opportunity**

Johnson-Laird, 1988:208

Ok, you are researchers,  
and you want the  
complex definition!

Here you go!

JOURNAL OF  
**Creative Behavior**  
Publication of the Creative Education Foundation

## Redefining Creativity — Analyzing Definitions, Collocations, and Consequences

PANAGIOTIS G. KAMPYLIS ✉ JURI VALTANEN ✉

First published: 22 December 2011 | <https://doi.org/10.1002/j.2162-6057.2010.tb01333.x> |  
Citations: 115

PDF TOOLS SHARE

### Abstract

How holistically is human creativity defined, investigated, and understood? Until recently, most scientific research on creativity has focused on its positive side. However, creativity might not only be a desirable resource but also be a potential threat. In order to redefine creativity we need to analyze and understand definitions, collocations, and consequences of creativity. In this paper, we reviewed 42 explicit definitions and 120 collocations. The thematic analysis of our data reveals that the vast majority of creativity definitions do not emphasize the positive/negative aspects of the concept. Neither are the negative aspects of creativity emphasized in its numerous collocations. Thus, we propose a comprehensive definition of creativity and a three-dimensional analytical framework for investigating its consequences, positive and/or negative. Finally, we highlight the need to move to a new era of *conscientious creativity*, in which all humans are considered able and wise enough to *create something ethical and constructive* for everyone in society.

bit.ly/4byTskT

**Ok, you are researchers,  
and you want the  
complex definition!**

Creativity is the general term we use to describe an individual's attitude to, ability for, and style(s) of creative thinking that leads to a **structured and intentional activity, mental and/or physical**. This activity may be **personal** and/or **collective**, occurs in a specific space–time, political, economic social, and cultural **context**, and **interacts with it**. The creative activity aims to realize the creative potential of the creator(s) and leads to **tangible or intangible product(s)** that is (are) **original, useful, and desirable** at least for the creator(s). The creative product(s) should be used **for ethical and constructive purposes**.

# The four creativity eras

- 1. The metaphysical era:** From antiquity to the Renaissance. For a few geniuses.
- 2. The aristocratic era:** From the Renaissance to the middle of the 20th century. For a few charismatic geniuses
- 3. The democratic era:** From the middle of the 20th century up to the dawn of the 21st century. For anyone
- 4. The AI era:** From the introduction of Generative AI. Human-machine creativity (or augmented creativity). For the ones who have access to GenAI

"Our findings suggest that GAI's are **valuable assistants** in the creative process"



Journal of Creativity

Volume 33, Issue 3, December 2023, 100066



## Artificial muses: Generative artificial intelligence chatbots have risen to human-level creativity ☆

Jennifer Haase <sup>a b</sup> , Paul H.P. Hanel <sup>c</sup>

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<https://doi.org/10.1016/j.jyoc.2023.100066>

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### Abstract

A widespread view is that Artificial Intelligence cannot be creative. We tested this assumption by comparing human-generated ideas with those generated by six Generative Artificial Intelligence (GAI) chatbots: alpa.ai, Copy.ai, ChatGPT (versions 3 and 4), Studio.ai, and YouChat. Humans and a specifically trained AI independently assessed the quality and quantity of ideas. We found no qualitative difference between AI and

<https://www.sciencedirect.com/science/article/pii/S2713374523000250>

“This study highlights the potential of AI as a tool to enhance creativity, it also underscores the unique and complex nature of human creativity that may be difficult to fully replicate or surpass with AI technology”

## scientific reports



OPEN

### Best humans still outperform artificial intelligence in a creative divergent thinking task

Mika Koivisto<sup>1</sup> & Simone Grassini<sup>2,3</sup>✉

Creativity has traditionally been considered an ability exclusive to human beings. However, the rapid development of artificial intelligence (AI) has resulted in generative AI chatbots that can produce high-quality artworks, raising questions about the differences between human and machine creativity. In this study, we compared the creativity of humans (n = 256) with that of three current AI chatbots using the alternate uses task (AUT), which is the most used divergent thinking task. Participants were asked to generate uncommon and creative uses for everyday objects. On average, the AI chatbots outperformed human participants. While human responses included poor-quality ideas, the chatbots generally produced more creative responses. However, **the best human ideas still matched or exceeded those of the chatbots. While this study highlights the potential of AI as a tool to enhance creativity, it also underscores the unique and complex nature of human creativity that may be difficult to fully replicate or surpass with AI technology.** The study provides insights into the relationship between human and machine creativity, which is related to important questions about the future of creative work in the age of AI.

<https://www.nature.com/articles/s41598-023-40858-3.pdf>

“These propositions explain not only why AI is not independently creative, but also how AI can support and augment human creativity in areas such as education”

## How Does Narrow AI Impact Human Creativity?

Rebecca Marrone , David Cropley & Kelsey Medeiros

Received 25 Apr 2023, Published online: 15 Jul 2024

“ Cite this article

 <https://doi.org/10.1080/10400419.2024.2378264>

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### ABSTRACT

While Artificial Intelligence (AI) is set to transform how we live, work, and play, competencies such as creativity remain fundamentally human. However, the way we learn, develop, and deploy creativity will be impacted by AI. This paper sets out four underpinning propositions that will help to guide the integration of AI and human creativity. These propositions explain not only why AI is *not* independently creative, but also how AI can support and augment human creativity in areas such as education. It will also highlight implications for the development of creativity in an educational context.

<https://www.tandfonline.com/doi/full/10.1080/10400419.2024.2378264#abstract>

“Artificial Intelligence”  
is a misleading term.  
Better to conceptualise  
it as an **Intelligent  
Assistant (IA)** who is  
extremely efficient in  
handling the vast  
amount of available  
**human-created  
knowledge, info and  
digital artefacts**



<https://www.ilo.org/meetings-and-events/ai-labour-disclosure-initiative-recognizing-social-cost-human-labour-behind>



## The updated definition of creativity

Creativity is the general term we use to describe an individual's attitude to, ability for, and style(s) of creative thinking that leads to a **structured and intentional activity, mental and/or physical**. This activity may be **personal** and/or **collective** and **technology-augmented**, occurs in a specific space–time, political, economic social, and cultural context, and **interacts with it**. The creative activity aims to realize the creative potential of the creator(s) and leads to **tangible or intangible product(s)** that is (are) **original, useful, and desirable** at least for the creator(s). The creative product(s) should be used **for ethical and constructive purposes**.

**By asking better questions, we can harness the full potential of GenAI and boost our creativity as lifelong learners!**



Photo by [Tim Mossholder](#) on [Unsplash](#)

**The power of the  
(right) questions is  
crucial for problem-  
solving**

**Problem formulation =  
half of problem-solving!**



Photo by [engin akyurt](#) on [Unsplash](#)

# Let's practice

**Have you ever asked  
GenAI to question YOU?  
If yes, raise your hand!**



**You are an experienced university lecturer. Develop a lesson plan for teaching first-year undergraduates about the energy consumption of GenAI. Ask me questions before you answer.**



I'd be glad to help with this! Here are a few questions to shape the lesson plan:

1. **Course Context:** Which course is this lesson part of (e.g., Environmental Studies, Computer Science, or Data Science)? This helps target the technical or ethical focus.
2. **Student Background Knowledge:** Do the students have any background in AI, machine learning, or energy studies, or should we start with foundational concepts?
3. **Lesson Duration:** How much time do we have for this lesson? This will influence the depth and type of activities.
4. **Learning Objectives:** Are there specific learning outcomes you'd like students to achieve, such as understanding how energy is consumed in AI processes, or exploring sustainable AI solutions?
5. **Assessment:** Are you interested in including a formative assessment, like a quiz or a reflective activity, to gauge their understanding?
6. **Resources Available:** Would you like to incorporate any specific materials, such as articles, videos, or datasets, or would you prefer that I recommend some?



Let me know your preferences, and I'll design a tailored plan!

**You are an international expert in adult education and lifelong learning. I want you to develop an action plan for promoting the development of adult educator's digital competence in a low-resourced country. Ask me questions before you answer.**



To develop an effective action plan for promoting the digital competence of adult educators in a low-resourced country, it's crucial to understand the specific context and challenges you are dealing with. Here are some key questions that will help tailor the plan to your needs:

#### 1. Context and Current State:

- What is the current level of digital literacy among adult educators in your country? (e.g., Are they familiar with basic digital tools, or is there a significant digital skills gap?)
- Are there existing programs or initiatives aimed at improving digital skills in adult education? (e.g., Government, NGOs, or international organizations' efforts.)

#### 2. Infrastructure and Resources:

- What kind of infrastructure is available in terms of internet access, hardware, and software? (e.g., Do educators have access to reliable internet, devices, or digital platforms?)
- What budget or funding opportunities are available for such initiatives? (e.g., Are there local or international funds you can tap into for training and resources?)

#### 3. Training and Capacity Building:

- What is the existing capacity for training adult educators in digital skills? (e.g., Are there local institutions or experts who can facilitate training, or would you need external support?)
- What are the specific digital competencies you wish to develop? (e.g., Basic digital literacy, online teaching strategies, or using specific educational technologies.)

#### 4. Cultural and Societal Context:

- What cultural or societal barriers exist to adopting digital tools in adult education? (e.g., Attitudes towards technology, language barriers, or resistance from educators.)
- How does the government view digital education for adults, and is there support for such initiatives? (e.g., Are there policies in place, or would advocacy be needed?)

#### 5. Sustainability and Partnerships:

- What local partnerships could support this initiative (NGOs, universities, tech companies)? (e.g., Are there local or international organizations that could provide ongoing support or collaboration?)
- How do you envision the sustainability of this initiative over the long term? (e.g., Would it require ongoing training, monitoring, or a community of practice for educators?)

#### 6. Target Audience and Needs:

- Are there specific regions or educator groups that need particular focus due to low resources? (e.g., Rural vs. urban areas, teachers of specific subjects.)
- What are the learning needs and priorities of the adult learners themselves? (e.g., Do adult learners need specific training in vocational skills, literacy, or other subjects?)

#### 7. Evaluation and Monitoring:

- How will you measure the success of this initiative? (e.g., Increased digital competence, more online classes, improved learning outcomes for adults?)

With answers to these questions, I can craft a strategic and practical action plan to improve the digital competence of adult educators in low-resourced settings.

You are an expert in applying creativity techniques. Apply De Bono's **six hats technique** for exploring the {subject}.

{subject}: Digitalisation of higher education in Greece

### 1. White Hat (Facts and Information)

- **Current State:** Assess Greece's current level of digital integration in higher education, including internet access, digital literacy, and availability of online platforms.
- **Data on Usage:** What percentage of higher education institutions in Greece have adopted digital learning tools? How are they used (e.g., for lectures, assessments, resources)?
- **Technology Infrastructure:** The state of digital infrastructure, including internet speed, reliability, and student access to devices.
- **Global Comparisons:** Data on digitalization in Greek universities compared to other EU countries.

### 2. Red Hat (Feelings and Emotions)

- **Student Attitudes:** Are students receptive or resistant to digital education? Are they anxious, excited, or indifferent?
- **Faculty Response:** How do faculty members feel about shifting from traditional to digital teaching? Do they feel supported or overwhelmed?
- **Public Sentiment:** What are the general public's attitudes toward digital higher education in



You are an expert in {topic}. Please list as many **different perspectives** as there are on the topic. Think about it from the point of view of lots of different audiences who have an interest in the topic. Write your response as a bullet-pointed list. Let's explore this further with **examples**

{topic}: Cognition and exploratory learning

- **University Professors in STEM Fields**
  - Focus on creating exploratory learning environments that encourage experimentation and critical thinking.
  - **Example:** Professors in chemistry might set up inquiry-based labs where students have to design their own experiments rather than follow a pre-set procedure, allowing them to engage directly with the scientific process.
- **Artificial Intelligence Researchers**
  - Aim to model human cognition and exploratory learning processes in machines, making AI capable of curiosity and independent learning.
  - **Example:** Robotics labs may program "curious" robots that explore their surroundings to learn, like a robot vacuum mapping a new house layout to identify where it's safe to move.
- **Philosophers and Ethicists**
  - Examine the role of curiosity and exploratory learning in human flourishing, autonomy, and moral development.
  - **Example:** Ethicists might argue for the importance of free play in childhood, discussing how unstructured exploration helps children develop autonomy and a sense of agency, qualities important to ethical reasoning.

18 points of view in the first go and 18 in the second.

You are an expert in {topic}. Please provide some **analogies** to make your work understandable to a lay person.

{topic}: Cognition and exploratory learning

### 1. Cognition as a "Mental Toolbox"

- **Analogy:** Imagine your brain as a toolkit, like one a mechanic or carpenter would use. Each tool inside has a specific purpose—pliers for gripping, a hammer for hitting, a screwdriver for tightening. Similarly, cognition involves a range of "mental tools" like memory, attention, and problem-solving. When you encounter a situation, you draw on the right "tool" to help understand or respond to it.
- **How It Helps:** Just as a toolkit has various instruments suited to different jobs, cognition involves many mental processes working together to help us make sense of the world and respond effectively.

### 2. Exploratory Learning as "Learning to Walk in a New City"

- **Analogy:** Imagine moving to a brand-new city and deciding to explore it on foot. At first, you wander without a clear direction, noticing landmarks, streets, and signs. Over time, as you take different paths, you begin to understand the layout and recognize shortcuts, eventually learning how to navigate effectively. Exploratory learning works similarly, especially for children—it's about figuring things out by trial and error, rather than following a step-by-step guide.
- **How It Helps:** This analogy emphasizes how curiosity and trial help people (especially children) build a deeper understanding, like getting a "mental map" of a topic or skill through exploration.

## 8 creative prompt engineering tips

1. **Ask me questions** before you answer
2. Let's explore this further with **analogies**
3. Let's explore this further with **examples**
4. **Explain your thinking**
5. Act **unlike a typical AI**
6. Let's explore this further in a **wider context**
7. Let's explore this further from the **opposite perspective**
8. What would be an alternative or **another way to look at it?**
9. ...

# Takeaways

## Takeaways

**In the era of AI, we have the means and a great opportunity to be more creative with the help of technology. But we must carefully define our motives (as creativity also has its DARK SIDE)!**

**Don't forget the  
environmental impact  
and ethical challenges  
of GenAI – use it when  
it adds a real value!**



**DOING THINGS BETTER  
DOING BETTER THINGS**

## Takeaways

**Effective questioning  
is the basis for good  
teaching, creativity  
and productive and  
ethical use of  
Generative AI**

# Any questions?

Panagiotis **KAMPYLIS**, PhD  
Education expert and consultant

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