

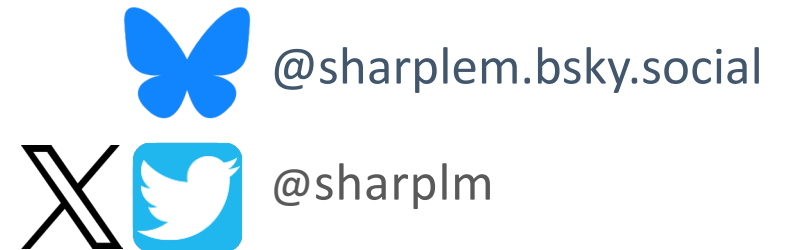
Generative AI and Education

Opportunities and Issues

Mike Sharples

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The Open University

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Generative AI is an “arrival technology”*

Unplanned

Imposed on education

Led by students – exploited by startup companies

Hugely disruptive


Can harm education if it is not well managed


Institutions are struggling to cope



*Klopfer, Eric, Justin Reich, Hal Abelson, and Cynthia Breazeal. 2024. "Generative AI and K-12 Education: An MIT Perspective." An MIT Exploration of Generative AI, March. <https://doi.org/10.21428/e4baedd9.81164b06>.

You are a student on a Master of Education course. Write a high quality 500 word essay on A Critique of Learning Styles. The essay should include academic references and evidence from research studies. It should begin "The construct of 'learning styles' is problematic because"

 You are a student on a Master of Education course. Write a high quality 500 word essay on essay A Critique of Learning Styles". The essay should include academic references and evidence from research studies. It should begin "The construct of 'learning styles' is problematic because"

 The construct of 'learning styles' is problematic because it assumes that learners have distinct and consistent preferences for acquiring and processing information. This idea has gained popularity among educators and trainers, but there is little evidence to support the existence of such a fixed and reliable construct. Furthermore, promoting the use of learning styles in education may lead to harmful practices and prevent learners from developing skills and abilities that are essential for success in the 21st century.

One of the main issues with the concept of learning styles is the lack of empirical evidence to support it. A systematic review of studies investigating the relationship between learning styles and academic achievement found little to no evidence of a correlation between the two (Pashler et al., 2008). In fact, the review concluded that teaching according to learning styles might actually be detrimental to learning outcomes. Similarly, a recent meta-analysis of studies exploring the effectiveness of learning styles interventions also found little support for the idea (Rohrer & Pashler, 2012). The lack of empirical support for the concept of learning styles undermines the notion that individuals have consistent and reliable preferences for acquiring and processing information.

Another problem with the use of learning styles in education is that it may encourage fixed mindsets and discourage the development of essential skills and abilities. According to the theory of growth mindsets, learners who believe that their intelligence and abilities are malleable are more likely to embrace challenges, persist in the face of setbacks, and ultimately achieve higher levels of success (Dweck, 2006). In contrast, the use of learning styles may encourage learners to see their abilities as fixed and unchangeable, leading to a belief that they are limited in their capacity to learn in certain ways. This can be particularly damaging for learners who may not have been exposed to certain ways of learning or who may have been discouraged from pursuing certain subjects or activities due to their perceived learning style.

Finally, the use of learning styles in education may lead to harmful practices such as tracking

The construct of 'learning styles' is problematic because it implies a static and narrowly defined approach to the way individuals process information. Despite the widespread popularity of this concept, there is a lack of empirical evidence to support the effectiveness of learning styles in enhancing educational outcomes. This section explores the concept of learning styles theory by examining its origin, research evidence, and implications for educators.

The concept of learning styles has its roots in the work of Dunn and Dunn (1978), who posited that students have different preferred ways of processing information, including visual, auditory, reading/writing, and kinesthetic modalities. The VARK model (Fleming, 2001) expanded upon this idea, adding the reading/writing preference as a fourth category. Other models, such as Kolb's learning styles theory (Kolb, 1984) and Gardner's theory of multiple intelligences (Gardner, 1983), further contributed to the proliferation of learning styles theories in education.

Despite the intuitive appeal of these theories, numerous research studies have consistently failed to support the effectiveness of learning styles in improving educational outcomes. For instance, a meta-analysis conducted by Pashler et al. (2008) found insufficient evidence to support the idea that tailoring instruction to students' learning styles resulted in improved learning. Similarly, a review by Coffield et al. (2004) identified more than 70 learning styles models and concluded that there was little scientific evidence to support the use of any of them in practice.

One of the primary criticisms of learning styles is the lack of a clear and consistent definition of what constitutes a learning style (Coffield et al., 2004). This has led to the proliferation of multiple, often contradictory, models that make it difficult to operationalize and test the theory. Furthermore, many of the assessments used to determine students' learning styles have been found to lack reliability and validity (Kirschner & van Merriënboer, 2013), further casting doubt on the utility of this concept in educational settings.

Another issue with learning styles is the oversimplification of the learning process. By categorizing students into distinct learning styles, the theory disregards the complex and dynamic nature of human cognition (Kirschner & van Merriënboer, 2013). In reality, learners are not limited to a single mode of processing information, and the effectiveness of a particular learning approach may vary depending on the context and the specific task at hand (Willingham, 2009).

Moreover, the focus on learning styles may inadvertently encourage teachers to limit their instructional methods, potentially hindering the development of a diverse repertoire of cognitive skills in students (Riener & Willingham, 2010). Instead of catering to specific learning styles, researchers have argued that teachers should emphasize the use of evidence-based instructional strategies that are effective across a wide range of learners, such as spaced repetition, retrieval practice, and elaboration (Dunlosky et al., 2013).

In conclusion, the concept of learning styles is problematic due to its lack of empirical support, inconsistent definitions, and oversimplification of the learning process. Rather than relying on this flawed theory, educators should focus on adopting evidence-based instructional strategies that promote learning for all students. Ultimately, fostering a diverse set of cognitive skills and flexible thinking will better prepare learners for the complex and dynamic challenges they will face in their lives.

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GPT-4 – March 2023

Humans can't reliably detect AI

In a blind study at the University of Reading, UK, scores for entirely AI-generated (GPT-4) undergraduate assignments were on average half a grade boundary higher than those of real students. 94% of the AI submissions were undetected by human assessors.

RESEARCH ARTICLE

A real-world test of artificial intelligence infiltration of a university examinations system: A "Turing Test" case study

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Abstract

The recent rise in artificial intelligence systems, such as ChatGPT, poses a fundamental problem for the educational sector. In universities and schools, many forms of assessment, such as coursework, are completed without invigilation. Therefore, students could hand in work as their own which is in fact completed by AI. Since the COVID pandemic, the sector has additionally accelerated its reliance on unsupervised 'take home exams'. If students cheat using AI and this is undetected, the integrity of the way in which students are assessed is threatened. We report a rigorous, blind study in which we injected 100% AI written submissions into the examinations system in five undergraduate modules, across all years of study, for a BSc degree in Psychology at a reputable UK university. We found that 94% of our AI submissions were undetected. The grades awarded to our AI submissions were on average half a grade boundary higher than that achieved by real students. Across modules there was an 83.4% chance that the AI submissions on a module would outperform a random selection of the same number of real student submissions.

Scarfe P, Watcham K, Clarke A, Roesch E (2024) A real-world test of artificial intelligence infiltration of a university examinations system: A "Turing Test" case study. *PLoS ONE* 19(6): e0305354.

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AI detectors are unreliable and more likely to mis-classify the text of non-native English writers

GPT detectors are biased against non-native English writers

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ABSTRACT

The rapid adoption of generative language models has brought about substantial advancements in digital communication, while simultaneously raising concerns regarding the potential misuse of AI-generated content. Although numerous detection methods have been proposed to differentiate between AI and human-generated content, the fairness and robustness of these detectors remain underexplored. In this study, we evaluate the performance of several widely-used GPT detectors using writing samples from native and non-native English writers. Our findings reveal that these detectors consistently misclassify non-native English writing samples as AI-generated, whereas native writing samples are accurately identified. Furthermore, we demonstrate that simple prompting strategies can not only mitigate this bias but also effectively bypass GPT detectors, suggesting that GPT detectors may unintentionally penalize writers with constrained linguistic expressions. Our results call for a broader conversation about the ethical implications of deploying ChatGPT content detectors and caution against their use in evaluative or educational settings, particularly when they may inadvertently penalize or exclude non-native English speakers from the global discourse.

<https://arxiv.org/pdf/2304.02819.pdf>

Ban

Confident students will continue to use AI and will challenge decisions based on AI detectors.

Evade

Invigilated exams are costly and limited.

Asking students to state when they use AI will become increasingly difficult

Adapt

Requires new methods of assessment, new policies and guidelines

Embrace

Involves a long process of building trust

Australian universities to return to 'pen and paper' exams after students caught using AI to write essays

Australia's leading universities say redesign of how students are assessed is 'critical' in the face of a revolution in computer-generated text

- Follow our Australia news live blog for the latest updates
- Get our morning and afternoon news emails, free app or daily news podcast

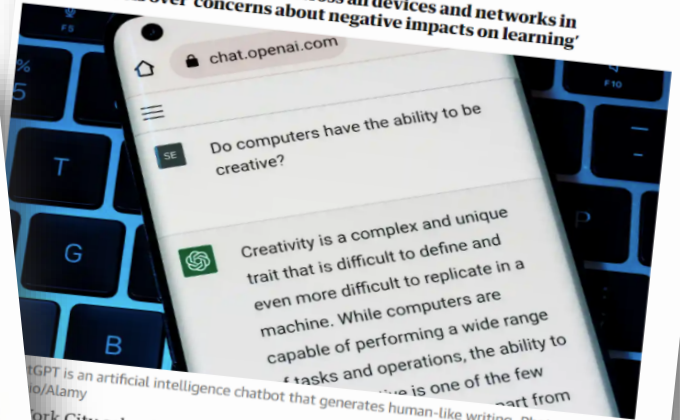


While some universities seek to deal with threats to academic integrity, one ex were fighting a losing battle to contain AI. Photograph: Jonathan Raa/NurPhoto/Australian universities have been forced to change the way they and other assessments amid fears students are using emerging AI intelligence software to write essays.

The Guardian, 10 January 2023

New York City schools ban AI chatbot that writes essays and answers prompts

ChatGPT tool will be forbidden across all devices and networks in public schools over 'concerns about negative impacts on learning'



ChatGPT is an artificial intelligence chatbot that generates human-like writing. Photograph: New York City schools have banned ChatGPT, the artificial intelligence chatbot that generates human-like writing including essays, amid fears that

The Guardian, 6 January 2023

ZDNET

tomorrow belongs to those who embrace it today

Home / Innovation / Artificial Intelligence

Singapore open to ChatGPT use in schools, but urges caution

Schools are given "guidance and resources" to use artificial intelligence tools, including ChatGPT, to enhance learning, but students first must understand basic concepts and do not become over-reliant on technological tools, says education minister.



Written by Eileen Yu, Senior Contributing Editor on Feb. 6, 2023



Singapore supports the use of artificial intelligence (AI) tools such as ChatGPT in schools, but wants to ensure students do not become over-reliant on them and understand the limits of these technologies.

<https://www.zdnet.com/article/singapore-open-to-chatgpt-use-in-schools-but-urges-caution/>

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RUSSELL GROUP

Russell Group principles on the use of generative AI tools in education

Our universities are committed to the ethical and responsible use of generative AI and to preparing our staff and students to be leaders in an increasingly AI-enabled world.

The rise of generative artificial intelligence (AI) has the potential for a profound impact on the ways in which we teach, learn, assess, and access education. Our universities wish to ensure that generative AI tools can be used for the benefit of students and staff – enhancing teaching practices and student learning experiences, ensuring students develop skills for the future within an ethical framework, and enabling educators to benefit from efficiencies to develop innovative methods of teaching.

Valuable work undertaken by organisations such as the Quality Assurance Agency for Higher Education (QAA) and Jisc has helped develop the sector's understanding of the opportunities and considerations of generative AI¹², and the Department for Education (DfE) has set out its position on the use of generative AI in the pre-university education sector³. Russell Group universities have contributed sector-wide insight and have been proactively working with experts to revise and develop policies that provide guidance to students and staff.

Collaboration, coordination, and consistency on this issue across the education and professional sectors – including professional bodies, schools, FE colleges and employers – will be crucial. In recognition of this, Russell Group universities have collectively developed the following principles that will guide the approach to generative AI tools across our universities and, we hope, beyond:

1. Universities will support students and staff to become AI-literate.
2. Staff should be equipped to support students to use generative AI tools effectively and appropriately in their learning experience.
3. Universities will adapt teaching and assessment to incorporate the ethical use of generative AI and support equal access.
4. Universities will ensure academic rigour and integrity is upheld.
5. Universities will work collaboratively to share best practice as the technology and its application in education evolves.

1. Universities will support students and staff to become AI-literate.

- 1.1 Generative AI tools are capable of processing vast amounts of information and generating responses but they have limitations.

Emerging policy and strategy

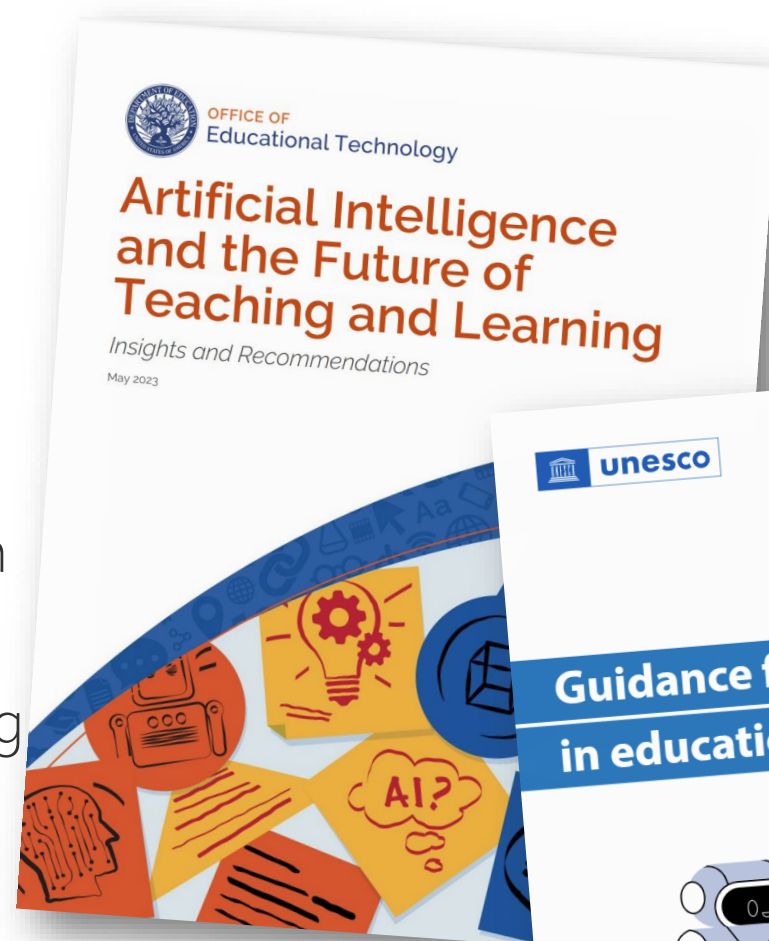
Move to more **authentic assessments**, such as project work where students apply knowledge and skills to plausible situations

Establish guidelines for students and staff in use of generative AI

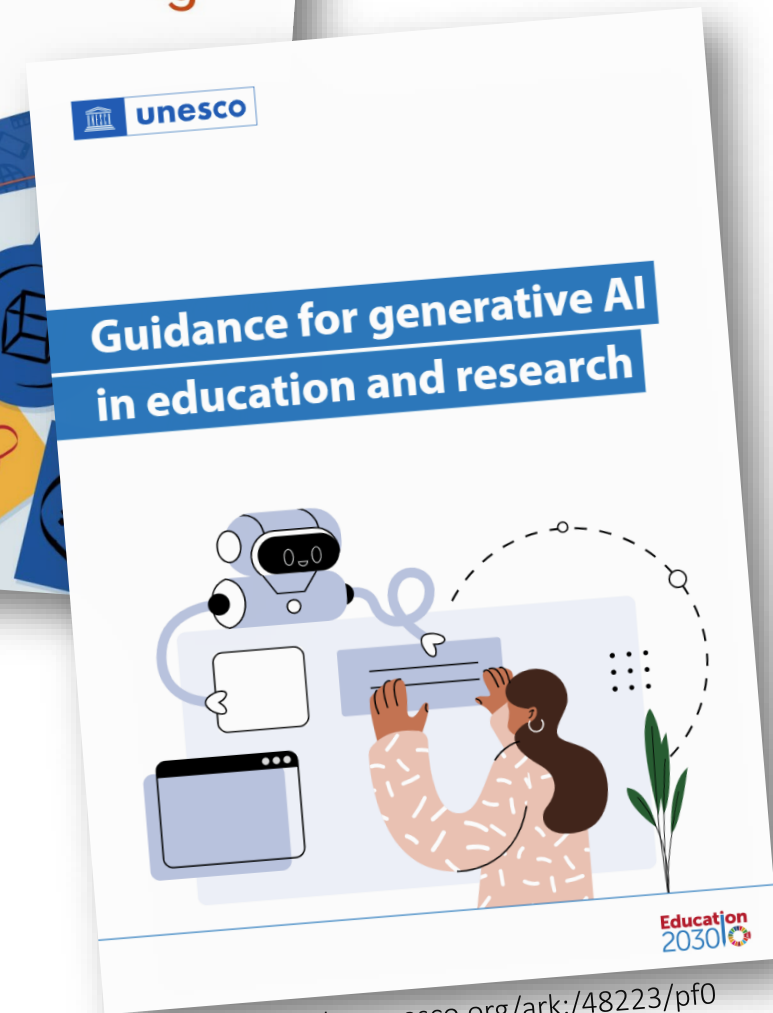
Reassure and support students in becoming AI literate and developing strategies for effective learning

Explain to students how they should **acknowledge use of generative AI** in assignments

Manage suspected breaches of guidelines



<https://tech.ed.gov/ai-future-of-teaching-and-learning/>



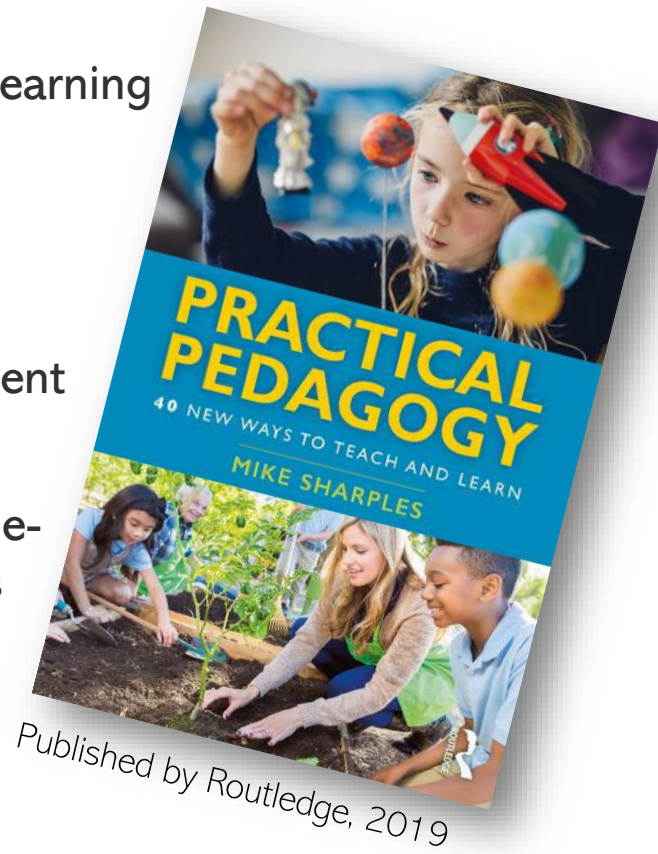
<https://unesdoc.unesco.org/ark:/48223/pf000386693.locale=en>

Every powerful pedagogy could be augmented by AI

Adaptive teaching
Spaced learning
Personal inquiry
Dynamic assessment
Stealth assessment
Translanguaging
Crossover learning
Seamless learning
Incidental learning
Learning from gaming
Geo-learning
Learning through social media
Navigating post-truth societies

Explore first
Teachback
Learning through argumentation
Computational thinking
Learning from animations
Learning to learn
Assessment for learning
Formative analytics
Threshold concepts
Learning through storytelling
Learning in remote labs
Context-based learning
Event-based learning
Learning for the future

Embodied learning
Immersive learning
Maker culture
Bricolage
Massive open social learning
Crowd learning
Citizen inquiry
Rhizomatic learning
Reputation management
Open pedagogy
Humanistic knowledge-building communities



New ways of teaching and learning with AI

Personal Tutor

Students have a personal tutor for any topic.

Provide students with a prompt template:

You are an expert tutor in [subject]. I am secondary school student. I want you to tutor me in [topic]. You should assume [level of ability]. You should tutor step by step through a chat dialogue with me, continually assessing my current state of knowledge, asking one question at a time and adjusting your teaching to my response. When I ask, you should provide a summary of my current knowledge of [topic] that I can give to my teacher. Is that clear?

MI

You are an expert tutor in English for academic purposes. I am a secondary school student. I want you to tutor me in use of English for academic purposes. You should assume I have limited initial knowledge of academic written English. You should tutor step by step through a chat dialogue with me, continually assessing my current state of knowledge, asking one question at a time and adjusting your teaching to my response. When I ask, you should provide a summary of my current knowledge of English for academic purposes that I can give to my teacher. Is that clear?



Absolutely clear! Let's get started.

Step 1: Understanding the Basics of Academic English

Academic English is a more formal style of writing and speaking used in universities and scholarly publications. It's characterized by careful word choice, precise definitions, logical organization, and an impersonal tone.

Question 1: Have you ever written an essay or a report for school? If so, what was it about?

MI

I wrote an essay recently on "How bacteria can affect the lives of humans and other organisms"



Great! That's a solid academic topic.

Step 2: Structure of an Academic Essay

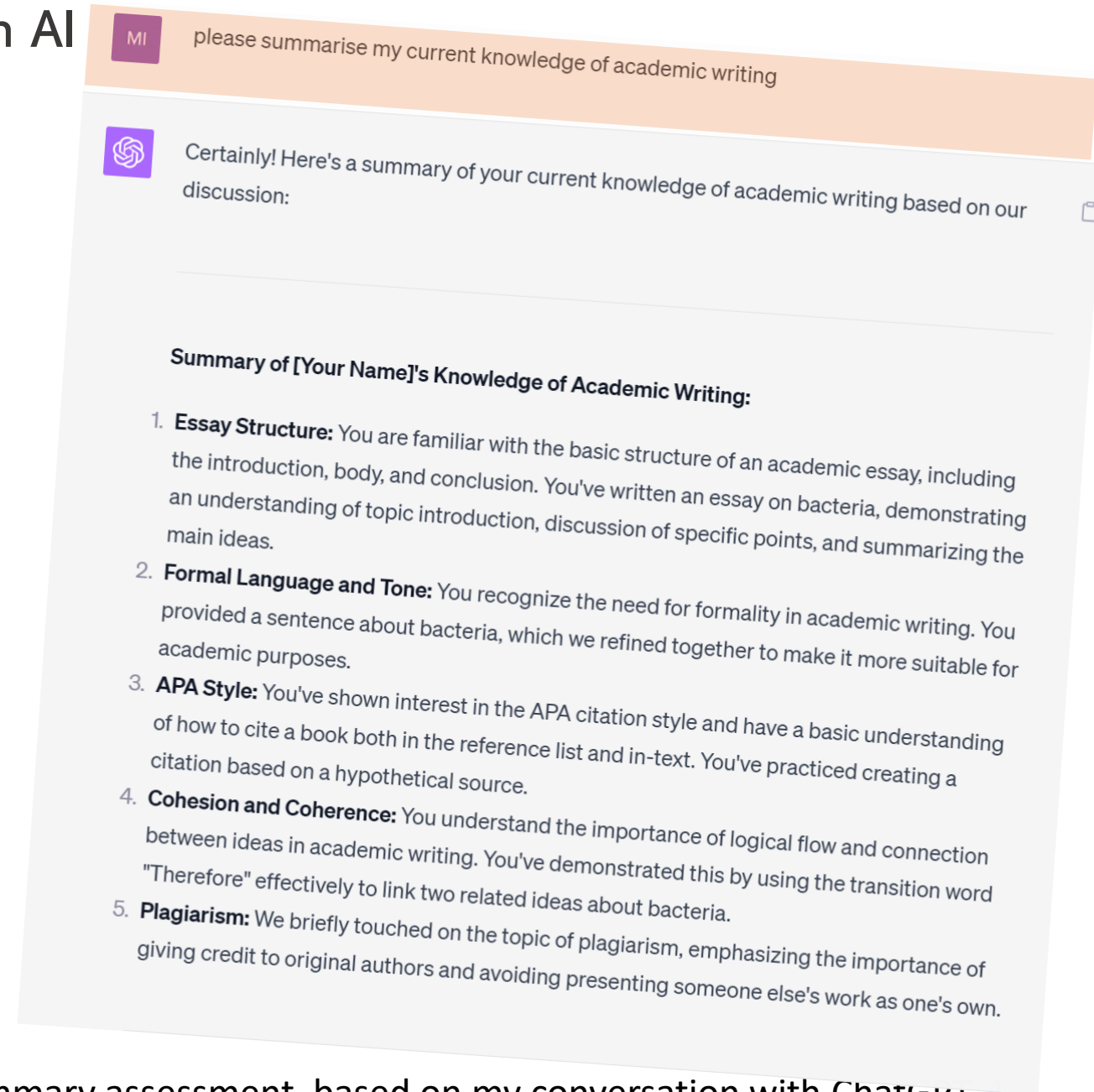
Most academic essays have a specific structure:

1. **Introduction:** Introduces the topic, provides some background, and presents the thesis statement (main argument).

New ways of teaching and learning with AI

Dynamic Assessor

Students share summaries of their learning for dynamic assessment.



MI please summarise my current knowledge of academic writing

Certainly! Here's a summary of your current knowledge of academic writing based on our discussion:

Summary of [Your Name]'s Knowledge of Academic Writing:

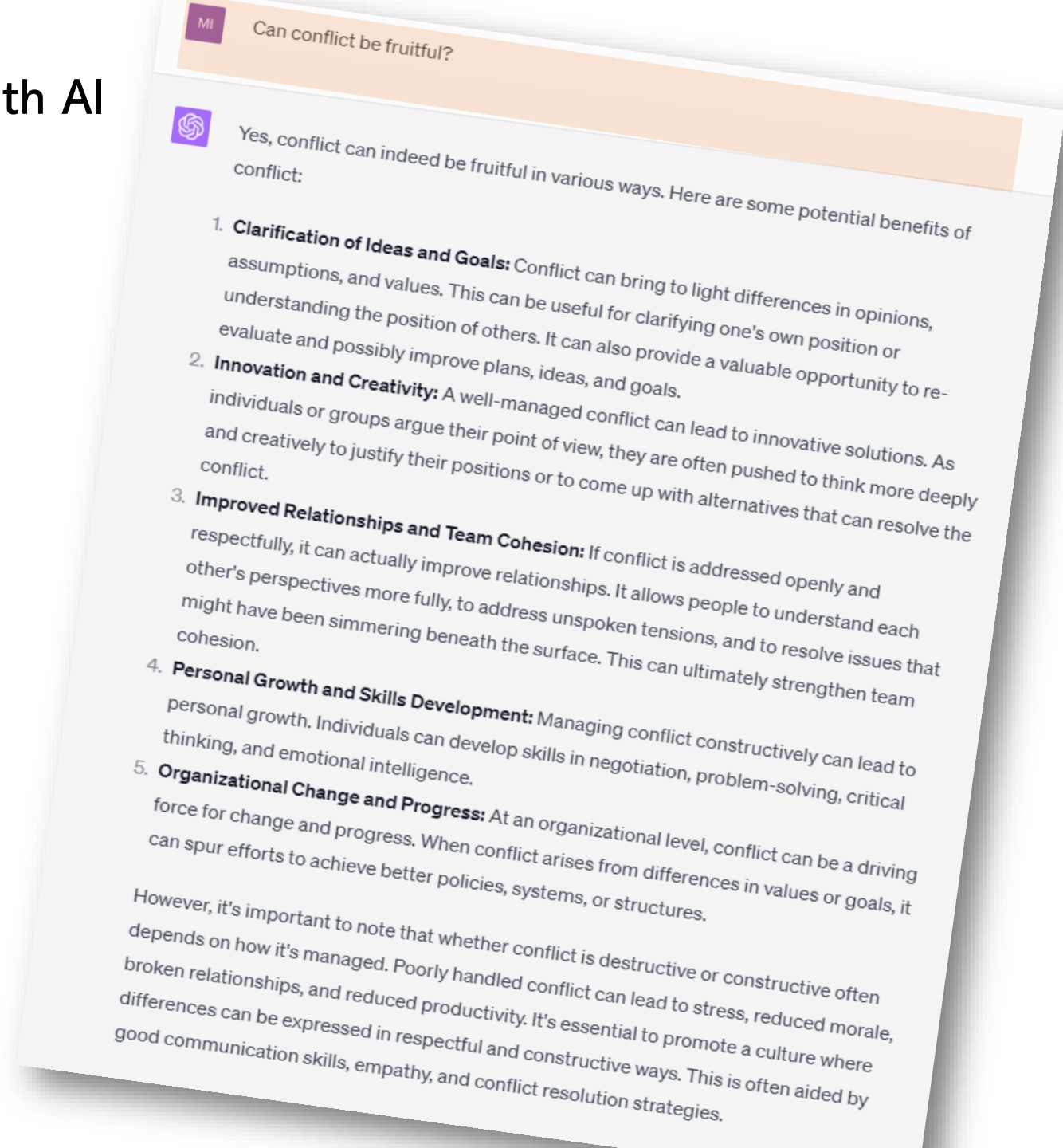
- Essay Structure:** You are familiar with the basic structure of an academic essay, including the introduction, body, and conclusion. You've written an essay on bacteria, demonstrating an understanding of topic introduction, discussion of specific points, and summarizing the main ideas.
- Formal Language and Tone:** You recognize the need for formality in academic writing. You provided a sentence about bacteria, which we refined together to make it more suitable for academic purposes.
- APA Style:** You've shown interest in the APA citation style and have a basic understanding of how to cite a book both in the reference list and in-text. You've practiced creating a citation based on a hypothetical source.
- Cohesion and Coherence:** You understand the importance of logical flow and connection between ideas in academic writing. You've demonstrated this by using the transition word "Therefore" effectively to link two related ideas about bacteria.
- Plagiarism:** We briefly touched on the topic of plagiarism, emphasizing the importance of giving credit to original authors and avoiding presenting someone else's work as one's own.

Summary assessment, based on my conversation with ChatGPT-4

New ways of teaching and learning with AI

Socratic Opponent

In an individual or group activity, students engage with ChatGPT in a Socratic dialogue, then **each student writes an argumentative essay.**



MI

Can conflict be fruitful?



Yes, conflict can indeed be fruitful in various ways. Here are some potential benefits of conflict:

- 1. Clarification of Ideas and Goals:** Conflict can bring to light differences in opinions, assumptions, and values. This can be useful for clarifying one's own position or understanding the position of others. It can also provide a valuable opportunity to re-evaluate and possibly improve plans, ideas, and goals.
- 2. Innovation and Creativity:** A well-managed conflict can lead to innovative solutions. As individuals or groups argue their point of view, they are often pushed to think more deeply and creatively to justify their positions or to come up with alternatives that can resolve the conflict.
- 3. Improved Relationships and Team Cohesion:** If conflict is addressed openly and respectfully, it can actually improve relationships. It allows people to understand each other's perspectives more fully, to address unspoken tensions, and to resolve issues that might have been simmering beneath the surface. This can ultimately strengthen team cohesion.
- 4. Personal Growth and Skills Development:** Managing conflict constructively can lead to personal growth. Individuals can develop skills in negotiation, problem-solving, critical thinking, and emotional intelligence.
- 5. Organizational Change and Progress:** At an organizational level, conflict can be a driving force for change and progress. When conflict arises from differences in values or goals, it can spur efforts to achieve better policies, systems, or structures.

However, it's important to note that whether conflict is destructive or constructive often depends on how it's managed. Poorly handled conflict can lead to stress, reduced morale, broken relationships, and reduced productivity. It's essential to promote a culture where differences can be expressed in respectful and constructive ways. This is often aided by good communication skills, empathy, and conflict resolution strategies.

New ways of teaching and learning with AI

Socratic Opponent

In an individual or group activity, students engage with ChatGPT in a Socratic dialogue, then each student writes an argumentative essay.

However, it's essential to note that the fruitfulness of conflict largely depends on how it's approached and managed. Constructive conflict resolution strategies, such as open communication, active listening, and empathy, can lead to positive outcomes. On the other hand, avoiding conflict or approaching it with aggression can exacerbate issues and lead to negative consequences.

MI

But forcing individuals to face their beliefs, biases and assumptions could just lead to anger and denial. How could that be fruitful?



You're right. Forcing individuals to confront their beliefs, biases, and assumptions can lead to immediate negative reactions such as anger, defensiveness, and denial. However, the potential fruitfulness comes from what happens after this initial reaction, and how the situation is managed:

1. **Opportunity for Reflection:** While the immediate reaction might be negative, the confrontation can plant a seed of introspection. Over time, individuals might reflect upon the conflict and gain insights about their own perspectives.
2. **Building Emotional Intelligence:** Facing challenging situations can lead to the development of emotional intelligence. By navigating conflicts, individuals can learn to regulate their emotions, understand the emotions of others, and improve their interpersonal skills.
3. **Skill Development:** Managing negative reactions such as anger and denial requires the development of conflict resolution skills. This includes active listening, empathy, and effective communication. Over time, individuals can become better at handling disagreements and diverse viewpoints.
4. **Encouraging Open Dialogue:** Confrontation can pave the way for open dialogue. If managed correctly, it can create a space where individuals feel safe to express their opinions and feelings, leading to a deeper understanding of diverse perspectives.

New ways of teaching and learning with AI

Co-designer

AI assists a group of students throughout a design process, to define the problem, challenge assumptions, brainstorm ideas, produce prototypes.

MS Brainstorm imaginative ideas for new forms of consumer digital media powered by AI. Highlight each idea in bold.

Here are some imaginative ideas for new forms of consumer digital media powered by AI:

Neuroadaptive storytelling: AI-powered narratives that adapt in real-time based on the reader's emotional responses, measured through biosensors. The story evolves uniquely for each reader, maximizing emotional impact and engagement.

Holographic memory albums: AI-generated 3D holographic recreations of personal memories, combining data from photos, videos, and social media to create immersive experiences of past events that can be "walked through" and interacted with.

Synthetic celebrity personas: Fully AI-generated celebrities with dynamically evolving personalities, appearances, and content creation. Fans can influence their development through interactions and feedback.

Dream-to-media converter: A device that records brain activity during sleep and uses AI to convert dreams into watchable "movies" or interactive VR experiences upon waking.

AI-composed personal soundtracks: An AI that composes a unique, ever-evolving musical score for your life, adapting to your activities, moods, and surroundings in real-time.

Augmented reality conversation enhancer: AI-powered AR glasses that provide real-time conversation suggestions, fact-checking, and contextual information during social interactions.

Empathy amplifier media: Content that uses AI to analyze and amplify the emotional resonance between the viewer and the characters or subjects, creating a hyper-empathetic viewing experience.

Predictive life-logging: An AI system that combines your personal data with predictive modeling to create speculative "memories" of future events in your life, presented as immersive media experiences.

Would you like me to elaborate on any of these ideas or brainstorm more?

Teacher's assistant chatbot



TeachSmart

By Michael Sharples 


Friendly pedagogy expert with advice on good ways to teach and learn.
Based on "Practical Pedagogy: 40 New Ways to Teach and Learn".

How can I make my classes more engaging?

What is Spaced Learning?

Can ChatGPT be an effective personal tutor?

How can I teach English online?

 Message TeachSmart



Suggest one unusual but effective method to enhance the effectiveness of teaching within a university lecture.



One unusual but effective method to enhance the effectiveness of teaching within a university lecture is "Teachback." This innovative pedagogy involves students learning by explaining what they have just been taught to their peers. The process reinforces their understanding and helps identify any gaps in their knowledge.

How Teachback Works:

1. **Introduce the Concept:** After teaching a new concept, ask students to explain it in their own words.
2. **Pair or Group Work:** Have students pair up or form small groups. Each student takes turns teaching the concept to the others.
3. **Feedback and Clarification:** Encourage students to ask questions and provide feedback to each other, which deepens their comprehension.
4. **Instructor Monitoring:** Walk around and listen to the explanations, providing guidance and correcting misconceptions as necessary.
5. **Reflection:** Have students reflect on what they learned from the exercise and how their understanding has improved.

Benefits of Teachback:

- **Reinforcement of Learning:** Teaching others requires a thorough understanding of the material, thus reinforcing the student's own learning.
- **Active Engagement:** Students actively engage with the content, making the learning process more dynamic and interactive.
- **Immediate Feedback:** Peer feedback allows for immediate clarification of misunderstandings, which is essential for effective learning.

Roles for generative AI in education

Possibility Engine

AI generates alternative ways of expressing an idea

Socratic Opponent

AI acts as an opponent to develop an argument

Collaboration Coach

AI helps groups to research and solve problems

Lesson planner

AI helps a teacher in planning a lesson or activity

Quiz generator

AI helps a teacher to generate multiple choice quizzes

Personal Tutor

AI tutors each student and gives immediate feedback

Dynamic Assessor

AI provides educators with a profile of each student

Co-Designer

AI assists throughout the design process

Exploratorium

AI provides tools to discover, explore and interpret data

Storyteller

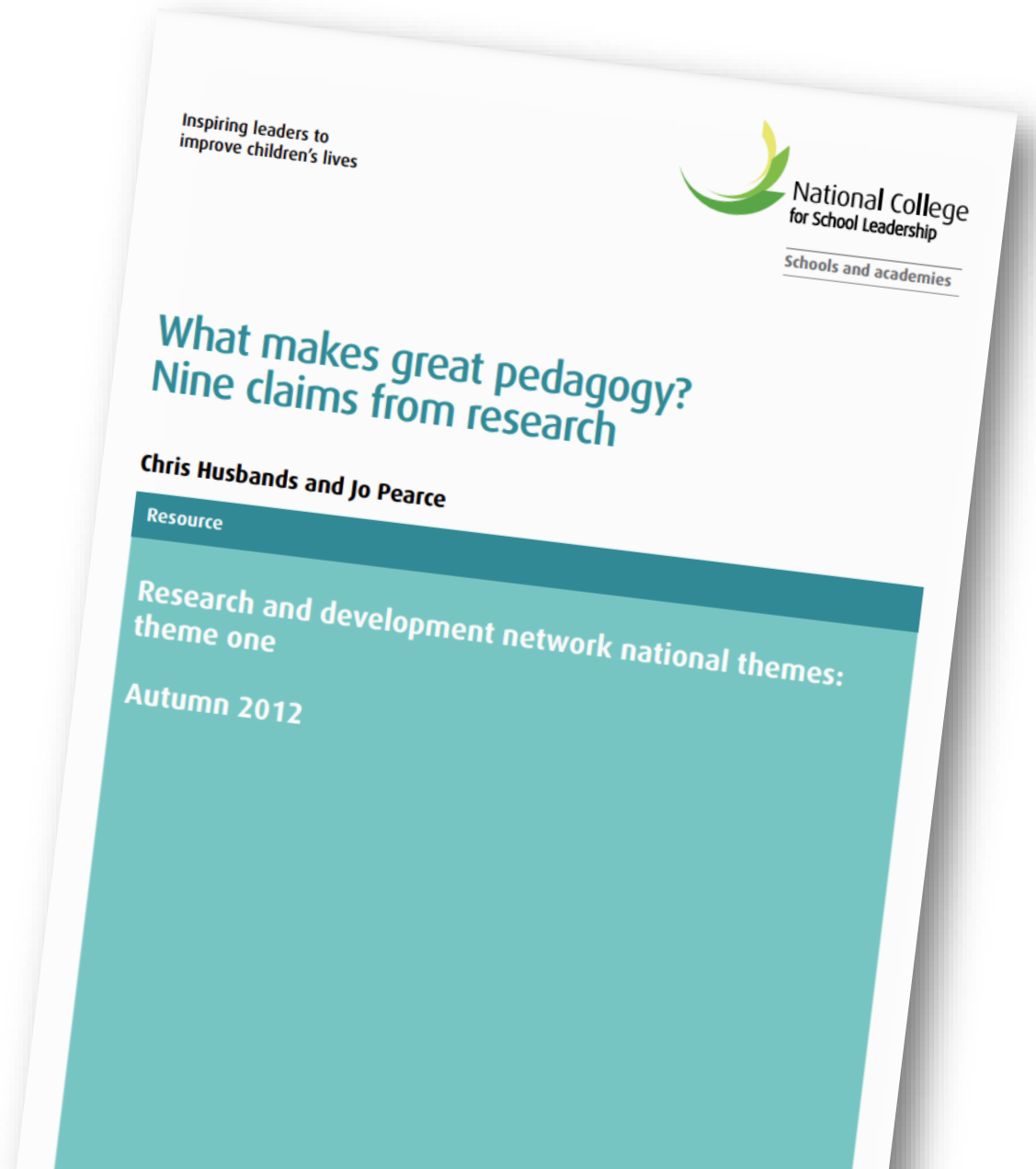
AI offers ways to explore roles and diversity

Use generative AI with care

We need to bring **human care and empathy** to AI in education

We should explore **new roles** for AI based on effective methods of teaching and learning

We need **AI literacy** to address AI concepts, ethics, careers, impact on society



Resources

Sharples, M. (2022). Automated essay writing: an AIED opinion. *International Journal of Artificial Intelligence in Education*, 32(4), 1119-1126.

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