

# The Impact of Generative Artificial Intelligence on Teaching, Learning, and Assessment

Some of the challenges and opportunities

## Introduction

If this article opened with the phrase 'As a large language model by OpenAI', you may have thought you just stumbled upon an artificial-intelligence-generated article that managed to pass by the editors of the *Yearbook*. You may still wonder, such are the times we live in, but fear not, these words are human-written by someone who is cautiously optimistic about the potential of generative artificial intelligence (AI) for teaching, learning, and assessment, while also acutely aware of the challenges it presents.

Generative AI is a type of AI capable of generating text, images, or other media, using what are known as generative models. For the uninitiated, the phrase 'As a large language model . . .' would suggest that a careless student (or indeed adult) had used ChatGPT to take a shortcut in producing some required written work and had forgotten to check the output for any obvious markers.

These types of generative AI, known as large language models (LLM), have become popularised this year by ChatGPT (from OpenAI), Bing (from Microsoft), and Bard (from Google). In simple terms, they are chatbots: programmes with which you could initially interact only through text input but which have now, in some instances, become multimodal. This means that through a combination of other techniques, they can process other types of data (image, speech, numerical) and, to varying degrees of success and accuracy, respond to a given query or task.



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**This article offers a broad overview of some of the challenges and opportunities associated with generative artificial intelligence. Given the technology's capabilities and availability, it is incumbent on us to consider our individual and collective response to the impact it could have in both formal and informal educational contexts.**

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Want it to write an essay for you? It will do that. Need to write a professional email? Sure thing. Interested in learning about a new topic? It will give you an overview and answer any questions you have. But – and this is a big but – you can never be assured that the output or response you get is entirely factual. In fact, the model's capacity for 'bullshitting' (Costello, 2023) or, to use the more technical but contested anthropomorphic term (Stojanov, 2023), 'hallucinating' (Li, Du, et al., 2023), can be high.

The flurry of excitement and trepidation in their use and what they could mean for the educational landscape is reasonable. Some critics contend, understandably, that companies acted irresponsibly by releasing this technology without fully considering its ramifications, but now that the cat is out of the proverbial bag (and it is unimaginable, despite likely regulations to curtail it, that it could ever be put back in), it is incumbent on us to thoughtfully consider our individual and collective responses to it.

## Challenges

To fully appreciate some of the challenges associated with this type of generative AI, in both educational and wider contexts, it's useful to have a rough understanding of how they work. LLMs are trained on vast amounts of textual data (think of it having read all the books in the library, or even all of Wikipedia). Using deep-learning techniques, they analyse the data to identify patterns of how often words or sequences of words appear together. When given a prompt, such as 'Write an essay on . . .', the model predicts a response based on the context of the words provided, generating the next word or sequence of words that have the highest likelihood based on its training. Essentially, it produces responses based on probabilities learned from the data it has been trained on.

Therein lies one of the key issues. It wouldn't be fair to say it 'knows' anything. In fact, sometimes it will just make things up or output fictitious information, particularly on complex topics. People therefore can never and should never solely rely on them as an accurate source of information.

That said, you can see their attractiveness to someone who may wish to take shortcuts with homework or an assignment. This is another valid challenge associated with the technology. How can we be sure that something submitted to us was written by the person who submitted it? This is even more problematic given that detectors designed to identify if work has been AI-generated lack reliability, have relatively easy workarounds, and disproportionately impact on non-native-English speakers (Liang et al., 2023).

It is also worth considering broader ethical (and potentially legal) issues. There are questions of consent surrounding the sources of the data these models

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were trained on (much of it scraped off the internet). If used in a school or educational context, is student data being commodified through its use in training and improving the model, thus adding value to the company? And is this okay?

Finally, we must acknowledge the valid concerns about the sustainability of this technology due to the significant resources it requires. One preprint study, awaiting peer review, suggests that it uses the equivalent of one 500 ml bottle of water for every 20–50 prompts it receives (Li, Yang, et al., 2023). This relates to broader discussions on the environmental impact of educational technologies and digital technologies (Selwyn, 2021).

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In the context of these issues, along with data protection, privacy, equity, access, bias, the human cost, and potential impact on human intellectual and skill development, it's fair to say there is much to be considered by educators, policymakers, and the public.

## Opportunities

Despite these challenges, and given that the technology is freely available and will be used, it is worth considering the potential it holds through some creative ways it is being implemented and applied. Even though it can be factually incorrect, you might be surprised to know just how well it can respond, even if it is just prediction based on probability.

In this context, several 'roles' have been conceptualised for LLMs (UNESCO, 2023a), such as:

*Possibility engine:* A student could use it to generate alternative ways of expressing an idea which could be analysed.

*Guide on the side:* It can be used to help brainstorm and help generate content and ideas for a lesson.

*Co-designer:* It can help with design, be it designing or updating the curriculum, developing rubrics and assessment criteria, or creating content for resources or worksheets.

Testing these approaches requires willingness to play around with the technology, in full acknowledgement and awareness of its limitations, while also developing effective prompting strategies. This has led to various prompting-strategy guides developed by teachers (Dunne, 2023; Herft, 2023).

The technology is being implemented in other ways. Khan Academy and Duolingo have implemented it as a personal tutor on their courses. Others have

developed programmes that allow you to query information from documents or databases. And the technology is being implemented by some of the largest companies in their suites of products as AI collaborators, such as Microsoft Co-Pilot and Google Duet.

This is before we even factor in that LLMs are becoming multimodal. Combined with other techniques, they can analyse images, identifying what they contain and answering questions about them. The models will continue to improve, and while they will never be perfect, they are likely to be useful. Meta recently announced it will include its AI in its Ray-Ban smart glasses, and we are likely soon to see further use cases and implementations (rightly or wrongly).

The technology's current promise lies in the fact that it can sometimes help with the creative process, deal with mundane tasks, offer guidance and feedback, and offer people a self-directed outlet from which to learn and develop, provided they are cognisant of the limitations.

## Conclusion

Whether the hype of this technology will amount to anything significant in the long run remains to be seen. But we need to consider how to respond effectively in the short and medium term. Initiatives are being undertaken to respond effectively, such as the creation of an AI advisory council here in Ireland (Department of Enterprise, Trade and Employment, 2023), and the work being done to consider appropriate regulations around AI. The Council of Europe Standing Conference of Ministers of Education recently agreed to develop a legal instrument to regulate the use of AI systems in education to protect learners' human rights.

It is doubtful that this technology ever should or could supplant the human connection that teaching and learning are based on (UNESCO, 2023b). Yet we need to carefully consider the impact it will have. We need to consider whether and how it can be used productively and proactively for the benefit of learners in human-centred ways, and specifically what type of AI literacies are needed as this technology becomes more ubiquitous in our daily lives and the lives of our students.

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## REFERENCES

Costello, E. (2023) 'ChatGPT and the educational AI chatter: Full of bullshit or trying to tell us something?', *Postdigital Science and Education*. DOI: 10.1007/s42438-023-00398-5

- Department of Enterprise, Trade and Employment (2023) 'Call for expression of interest – AI advisory council'. 24 July. Dublin: Government of Ireland. [www.gov.ie/en/publication/25307-call-for-expressions-of-interest-ai-advisory-council/](http://www.gov.ie/en/publication/25307-call-for-expressions-of-interest-ai-advisory-council/).
- Dunne, E. (2023) *ChatGPT for Teachers*. [https://portlaoisechs-my.sharepoint.com/personal/edunne\\_portlaoisechs\\_com/\\_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fedunne%5Fportlaoisechs%5Fcom%2FDocuments%2FIT%20Coordinator%2FED%20%2D%20ChatGPT%20for%20Teachers%2Epdf&parent=%2Fpersonal%2Fedunne%5Fportlaoisechs%5Fcom%2FDocuments%2FIT%20Coordinator&ga=1](https://portlaoisechs-my.sharepoint.com/personal/edunne_portlaoisechs_com/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fedunne%5Fportlaoisechs%5Fcom%2FDocuments%2FIT%20Coordinator%2FED%20%2D%20ChatGPT%20for%20Teachers%2Epdf&parent=%2Fpersonal%2Fedunne%5Fportlaoisechs%5Fcom%2FDocuments%2FIT%20Coordinator&ga=1).
- Herft, A. (2023) *A Teacher's Prompt Guide to ChatGPT aligned with 'What Works Best'*. <https://drive.google.com/file/d/15qAxnUzOwAPwHzoaKBjd8FAGiOZYclxq/view>.
- Li, Y., Du, Y., Zhou, K., Wang, J., Zhao, W.X., and Wen, J.R. (2023) 'Evaluating object hallucination in large vision-language models'. arXiv preprint arXiv:2305.10355.
- Li, P., Yang, J., Islam, M.A. and Ren, S. (2023) 'Making AI less "Thirsty": Uncovering and addressing the secret water footprint of AI models'. arXiv preprint arXiv:2304.03271.
- Liang, W., Yuksekgonul, M., Mao, Y., Wu, E., and Zou, J. (2023) 'GPT detectors are biased against non-native-English writers'. arXiv preprint arXiv:2304.02819.
- Selwyn, N. (2021) 'Ed-tech within limits: Anticipating educational technology in times of environmental crisis', *E-Learning and Digital Media*, 18(5), 496–510.
- Stojanov, A. (2023) 'Learning with ChatGPT 3.5 as a more knowledgeable other: An autoethnographic study', *International Journal of Educational Technology in Higher Education*, 20(1), 35.
- UNESCO (2023a) *ChatGPT and Artificial Intelligence in higher education – Quick start guide*. Paris: UNESCO. [www.iesalc.unesco.org/wp-content/uploads/2023/04/ChatGPT-and-Artificial-Intelligence-in-higher-education-Quick-Start-guide\\_EN\\_FINAL.pdf](http://www.iesalc.unesco.org/wp-content/uploads/2023/04/ChatGPT-and-Artificial-Intelligence-in-higher-education-Quick-Start-guide_EN_FINAL.pdf).
- UNESCO (2023b) *Technology in Schools – A tool on whose terms?* Paris: UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000385723>.

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**November 2023:**

Dr Brendan Jennings, Vice President for Research and Innovation presenting the Established Career Researcher Award to Economist Dr Catarina de Moura Pinto Marvão, whose research was used by the European Commission's Competition Department (DG-Competition) in designing policies to detect and deter cartels.