How to address artificial intelligence in the classroom

Introduction

AI-based generative technologies, such as ChatGPT, are revolutionising how we live, work and consume content and products, and education is not an exception. Because of their ability to generate coherent text in seconds, several educational institutions around the world have banned their use. In other areas, on the other hand, their incorporation is encouraged as a way of opening up the creative horizons of both teachers and students (Atlas, 2023; Sabzalieva and Valentini, 2023). Is it possible to know if a student really learned

from writing a reflective piece when it is so difficult to know if he or she wrote it autonomously and with no other support than his or her knowledge of the subject? How important is it to know these AI tools for textual generation beyond whether or not we will use them in the classroom and in our daily lives? How can we approach their responsible and critical use in the classroom? In the following pages we will try to think of possible ways in which these technologies can be incorporated into teaching proposals at secondary and higher education levels.

What is artificial intelligence (AI)?

AI is a system that processes large amounts of information to perform tasks that usually require human cognition to be carried out (such as playing chess, answering an email query, selecting candidates for a job or assigning health insurance). AI works on the basis of mathematical and statistical models that generate patterns from the data they process, which is why it is often said that machines 'learn': they actually generate processes automatically from the information they are given and produce a result autonomously.

AI consists of a technology that is increasingly present in everyday life as it is at the heart of various applications and websites. As such, it is said to guide our smallest decisions such as which street to turn right when driving, which series to watch at the weekend based on various recommendations, which product to buy based on previous searches or purchases. Virtual assistants such as Siri, Alexa and Google Assistant use AI to process an order and respond to users' voice commands. Platforms such as Netflix, Amazon and Spotify rely on AI to analyse user behaviour and offer personalised content suggestions. Many companies and institutions have incorporated the use of chatbots in their customer service departments to resolve frequently asked questions, arrange a medical appointment or allocate resources of various kinds. AI is being used in the medical field to diagnose diseases: systems analyse large amounts of data to identify patterns and predict possible diagnoses, which is helping doctors to make decisions with evidence that was previously impossible to obtain.

In addition to these general uses and definitions of AI that relate to its ability to take on tasks associated with human cognition (see UNESCO-COMEST, 2019), we consider it important to refer to an additional way of thinking about these technologies. Italian philosopher Luciano Floridi (2023a) proposes to define AI as the divorce between the ability to achieve a goal (choosing a transport route, answering a chat message, etc.) and the intelligence needed to perform that task. His question is not whether the system is intelligent in the traditional 'human' sense but rather whether it succeeds in accomplishing the proposed goal from a *prompt*, the technical word for a request or *input* in the specific field of AI. In Floridi's words, we are not interested in whether planes fly like birds or submarines swim like fish, what is important is that they can do so safely and efficiently. The same goes for AI: the focus should not be on whether machines are 'intelligent' or not, but rather, according to his perspective (Floridi, 2023b), we should concentrate on what task

they can perform effectively, beyond whether they carry out a 'flight simulacrum' or a 'copy' of what a human would do.

These ideas of copy and simulation have been discussed recently with the launch of various AI systems that automatically generate texts. ChatGPT, Perplexity, You.com or the new version of the search engine Bing, for example, work from an infinite number of texts on the internet to create unique products based on a request or *prompt* formulated by the user. They are called generative technologies because of their capacity to produce original pieces based on instructions that, in this case, are given in the format of a chat conversation. Because of their linguistic and operational fluency, they make it possible to quickly construct apparently novel texts that could very well have been written by humans. This characteristic raises debate and tensions in the educational field for at least two reasons of vital relevance for teachers and institutions: firstly, given the systems' capacity to generate original productions, plagiarism becomes undetectable. Several experiments and tests with these tools have shown that texts generated with these technologies can pass assessments at different levels, even at the postgraduate level (see Santamaría, 2023). This leads to the second challenge posed to education by AI which is related to the falsification of evidence of learning: if traditionally the writing of essays, reflections and monographs was used as an opportunity for students to structure knowledge that demonstrates what they have learnt, now they fail such a purpose as some of these productions can be generated automatically. This new scenario alerts teachers, universities and schools, given that the plagiarism detectors used to identify these risks have become obsolete.

In addition to these concerns, there are others, such as those related to the environmental cost of these technologies, especially the CO_2 emissions and the cost of water and electricity involved in processing the information in the data centres of the companies that manage the applications (see Lehuedé, 2023). Because of the enormous size of these systems, situations arise that could have effects on a global scale: What would happen if AI were to converge with government, war or air route decisions that are decided autonomously? What is the limit for these applications? How do we address regulatory systems with balance, speed and effectiveness? The size of the processors needed to accumulate and generate information in seconds casts doubt and uncertainty on the possibility of global human and biological collapse, as Costa (2021) argues.

Among specialists, questions also arise about the biases contained in the productions generated through these technologies: beyond the immense size of the digital world, if AI models rely on the information contained on the Internet and social networks, it is essential to consider that other voices and cultures with less access to networks, or perspectives that do not participate as actively in the digital world, are likely to be excluded from these databases (Bender et al., 2021; Buolamwini and Gebru, 2018).

For all these reasons and the technical complexity of the tools, we believe it is necessary to raise awareness of the challenges these generative technologies pose in the educational

field among teachers, students and families and test different tools in a variety of contexts. We support the idea that the key is to "trust students to experiment with the tools and guide them on how, when and where they can be used " (Mehta, 2023).

Glossary for further understanding (with some ChatGPT input)

To delve deeper into the field of generative technologies, in this section we offer some definitions and technical characteristics of AI systems that may help to understand the systems in more detail. The glossary was compiled from *prompts* and answers provided by ChatGPT and edited and adapted by the author of this paper:

Artificial intelligence: It refers to the ability of machines to perform tasks that normally require human intelligence, such as learning, perception, reasoning and problem solving.

Machine learning: It is a subset of artificial intelligence that involves the ability of systems to learn and improve autonomously through the analysis of data supplied to them.

Algorithms: These are sets of instructions that are used to perform a specific task. In AI, algorithms are used to analyse data and make decisions based on it: for example, suggesting content, recommending, and alerting about another transport route.

Neural networks: In the context of AI, neural networks are a type of machine learning algorithm inspired by the structure and function of the human brain. These networks are designed to recognise patterns and relationships in data.

Data: It is information that is used to 'train' and improve AI systems. Data can be of different types, such as image, text, sound, and video, among others. It is organised

Prompt: In the context of AI, it is a text or instruction provided to a system to generate a response. Prompts are used in a variety of AI applications, such as chatbots, text generation and machine translation, and even programming code. Prompts are a way to guide the behaviour of an AI model and obtain a desired result and can be provided by humans or automatically generated by other AI systems.

Training of AI systems: It is the process of 'teaching' an artificial intelligence system how to perform a specific task. Training is done by processing a set of data (see Supervised and unsupervised learning entry). The goal is for the system to learn to recognise patterns and relationships in the data in order to perform the desired task.

Supervised and unsupervised learning: These are two common approaches to 'training' artificial intelligence systems. Example of supervised learning: Suppose you want to train an animal recognition model to automatically identify the type of animal in an image. To do this, you need a previously labelled dataset containing images of different animals (cats, dogs, birds, etc.). The model will learn to

into *datasets* and used to 'feed' an AI model so that it can 'learn' how to respond to different topics.

Natural language processing: This is an area of AI that focuses on the ability of machines to understand and process human language in a similar way as people do. All the tools mentioned in this document (ChatGPT, Perplexity, etc.) are based on this technology.

Chatbot: It is a computer programme designed to interact with users in a similar way to a human being. Chatbots are used in many areas, such as customer service and personal assistance. They can send information, classify a request for help or provide assistance in assigning a resource prior to human intervention in the communication.

Conversational interface: This refers to the chat-like format through which humans interact with generative tools. It basically consists of a screen with a field for typing the initial question or request that alternates as the system generates a response.

associate specific characteristics of each animal with its corresponding label (e.g. the shape of the head and ears for a cat), which will allow it to identify the type of animal in a new image. Example of unsupervised learning: Suppose you have a set of animal images and you want to group them into different categories without providing the system with prior labels. In this case, you could use an algorithm to group the images based on common characteristics, such as body shape, skin type or natural habitat. The algorithm will find patterns and relationships in the data without the help of pre-tags, allowing groups of similar animals to be identified. For example, the algorithm could group images of lions, tigers and leopards together, and separate them from groups of giraffes, elephants and zebras. This will help to better understand the similarities and differences between different animal species.

Why talk to students about AI?

Considering the massive adoption of various AI tools in recent months, it is vitally important to talk to students about their generative nature and their potential and limitations for teaching and learning, always within a framework that values honesty and responsible use. Regardless of whether or not we will incorporate them into teaching proposals, it is key to acknowledge their existence and to explore what they can do to consider whether they are being used in an invisible or unethical way.

Taking advantage of these technologies in the classroom gives us the opportunity to analyse a request or *prompt* for textual generation, to make an instruction more specific, to evaluate whether the sources cited, if any, are valid, or to assess the quality of the content generated

from different perspectives: from the theory discussed in the bibliography, from a practical classroom implementation, or from the specificity of the disciplinary field in question. Experimenting together with the students is always a pleasant learning experience that can result in new and more powerful questions about the world and technology around us.

Approaching these tools in a critical way implies delving into their weaknesses and asking questions about the perspective that is privileged to generate the texts and the biases contained in these productions. For example, although they are competent technologies for processing data and creating texts in a wide variety of languages, repeated experiments have allowed us to detect that, depending on the topic requested, the tools tend to offer better productions in English than in Spanish. This simple fact entails thinking about the geographical and cultural origin of the corporations that design these platforms, their business model and the origin of the data used to train the AI systems.

In another educational experiment, we can test possible gender biases, for example, in the translation of texts into Spanish. There, we see the insistence on translating professions previously associated with men into the masculine: "The nurse helps the doctor" is usually translated assuming the feminine for nurse and the masculine for doctor, and not the other way around.

Finally, talking with students about generative technologies involves discussing the relevance of using reliable sources when it is necessary to search for information or support arguments with a bibliography. Requesting different productions from a tool (ChatGPT, Perplexity, Bard or You.com) and analysing them in the light of what has been learnt brings to the table the need to make the writing process transparent and check the sources used in text generation, while validating the contents.

In a recent test with student teachers at the School of Education of San Andrés University, professors Rebeca Anijovich and Mariana Ornique requested the production of summative assessment tools (multiple choice questions, questionnaires, true/false exercises) using ChatGPT. The results were generally acceptable but not always infallible: according to the students themselves, in many exercises there were conceptual errors, superficial definitions of some topics, and very gross generalisations on issues that required more detail. General looking writing was present in all productions. Even in those cases in which it was necessary to adjust the *prompt* (make it more specific or provide more information and context to obtain the desired result), the exploration activity was useful to know the potential and limitations of the tool in the generation of activities and proposals, to evaluate the adjustments to be made in the AI production offered, and to validate the contents from each disciplinary field.

Misconceptions about AI

In this section we will share some discussions on AI that help to clarify a number of misunderstandings about its technical constitution and its implementation in different

contexts. We believe it is also important to discuss with colleagues and students the constraints of this technology and its possibilities for use in the classroom.

It is intelligent: From common sense and from the name itself it is often claimed that AI systems are intelligent *per se*. However, it is necessary to understand that, although the information generated is usually coherent because it has a format which is similar to human communication, they are systems that process diverse data based on statistical models that construct a *probable* text, a simulacrum of what a human would write or say. These are messages that are not generated from the communicative intentionality or subjectivity of people. Although many of the productions could deceptively be passed off as human productions, recent experiments show limitations in the comprehension of complex questions, as shown in the example below:
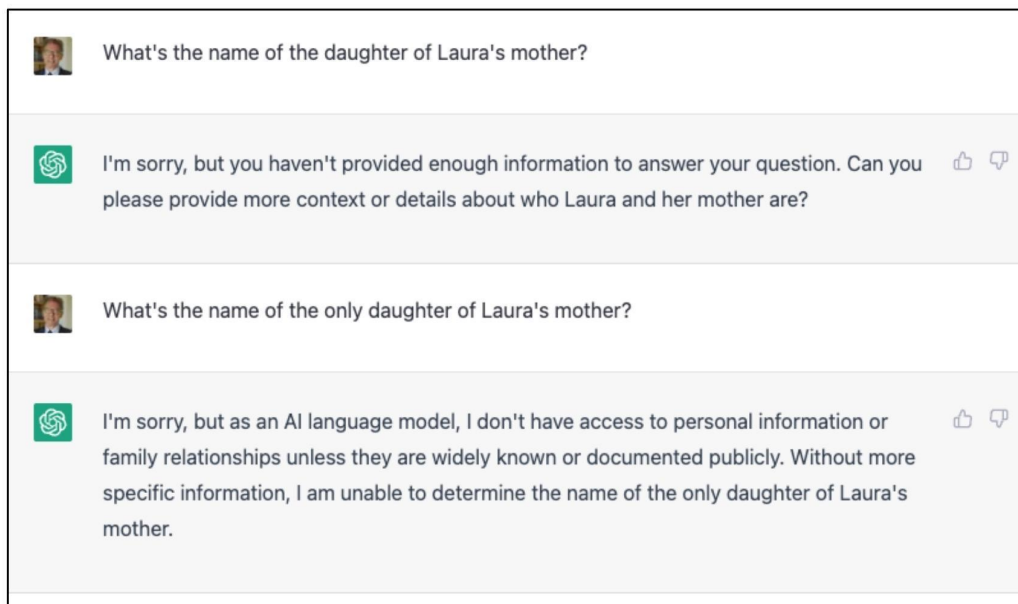
Source: Floridi, 2023.

It is a search engine like Google: Due to its generative nature and its operation based on probabilistic models, the answers created often contain erroneous or mismatched information for a given context. Therefore, unlike web search engines, which are used to evaluate sources and search for information, it is more convenient to use generative tools when you already have a deep knowledge of the topic you are asking about or making a request to the system.

One prompt is enough: The conversational interface allows alternating questions and answers. In general, the first creation of the system does not usually satisfy the needs of the human user and, since the system 'learns' from successive requests, it is useful to add several variables and specific data to obtain the expected response, adjusted to the context. The more information provided, the more accurate the prompt.

It is reliable: Because of its own statistical functioning, it tends to produce answers very efficiently and reliably. They are plausible creations, but this does not mean that the information contained in them is always reliable. A quick experimentation allows us to see that, when faced with an 'academic' request, some tools invent names of books and titles of articles as if they had been written by the authors mentioned. In these cases, it is often said that AI 'hallucinates', that is, it produces answers that are only a simulacrum of a message, a very credible but unreliable imitation of messages. It is always good to check these sources and remember that the more you know about a topic, the better you can assess whether the information generated is useful or not for the objective you are pursuing. Given the synthetic nature of the content created automatically via electromagnetic impulses, we discourage discussing whether the messages are 'lies' in the traditional sense, because that would imply thinking about some kind of truth underlying the messages, some link to the material world and human signifying experience, which is clearly absent in these productions (see Bender, 2023).

It is neutral: Like any technology, AI systems are subject to the worldviews and positions of those who build them, with the cultural, gender, linguistic and class biases inherent to all social groups. This attribute refers to the socio-technical constitution of all human activity, including the commercial logic of the companies that own the platforms (Scasserra, 2021; Selwyn, 2022) and the complex development of skills and knowledge needed to navigate digital scenarios (Aparici and Martínez-Pérez, 2021; Atenas, 2021; Ferrarelli, 2021). It is also necessary to remember that technologies do not have universal effects on the communities and practices in which they are embedded. Rather, it is useful to think about contextual variables for their approach, for example, by considering some of the following aspects: Is it possible to establish a definitive and stable framework for the use of AI in such diverse contexts (Selwyn, 2022)? In the case of teacher training, what other competencies do we need to develop as teachers and students in order to make a responsible and ethical use of AI in our practices, does it achieve traditional digital and media literacy, and how do we articulate present and past learning (Ferrarelli, 2021)?

Generative is the same as creative: It is very difficult to define creativity 'from scratch' because even when humans write something new we are using knowledge, intertextual relationships and skills that we have developed prior to writing. However, this contrast between the generative/creative character of the messages produced by AI technologies brings to the table a fundamental characteristic of these technologies, which is that they 'feed' on existing information, on ideas that others have already conceived, and simply reformulate, reformat or recycle them. While one can assume that recycling in itself is creating something new (and AI does not do that very well), let us bear in mind that because of their statistical functioning, these tools cannot, at least for now, interpret existing information in novel and creative ways, as people do: they cannot relate concepts in

innovative novel ways, create metaphors that add layers of meaning to a message, or play with double meanings and humour. They just reprocess what already exists and reformat it, there is no creation of meaning, no communicative intentionality in their messages.

These are digital tools that have no effect on immediate, everyday reality: cases of biased and improper use of AI models resulting in discriminatory and surveillance practices abound in the media and academic research (Kolkman, 2020; Van Dijck, 2014; Williamson, 2020). These problems trigger questions and debates about the neutrality of these tools and the biased nature of the data used to train them, as we will see below.

AI represents a tragedy/revolution for the educational field: Almost a year after the massive release of these generative technologies, we can claim that they are neither a tragedy nor do they represent an absolute revolution in the educational field. Rather, it is possible to affirm that they are tools that need to be explored in order to analyse their integration into teaching proposals.

The conversational format facilitates interaction with users: The chat-like interface is undoubtedly familiar to many users. However, it is key to remember that it is merely a simulacrum of a conversation in which there is neither an exchange of meaning, nor a mutual intention to meaningfully engage with another person who thrives on the exchange. We do not write to anyone who receives the message from the other side; we simply interact with a system that generates electronic messages automatically. The risks of anthropomorphising information exchanges with generative technologies can result in confusing a statistical system with true human sense-making.

It requires rethinking traditional teaching: Generative technologies can easily solve many exercises that are considered 'traditional' because they resort to linear transmission of content and memorisation. In general, these are activities and tasks that involve answering factual questions, filling in a table with information found on the web, etc. However, many other teaching situations that involve production activities and that are far from being considered traditional can also be falsified with automatic writing tools. Through their misuse, some of them even allow the falsification of productions intended as instances of authentic assessment (Anijovich and Cappelletti, 2020; Ravela and Cardoner, 2019). Here, pedagogical criteria must take precedence in order to evaluate all the variables of the context and eventually opt for a face-to-face handwriting instance that ensures reliable evidence of learning, a reflection of the real understandings that students have reached throughout their learning process.

For this reason, we propose at least four possible lines of work in the classroom to tackle this problem:
1. Return to a face-to-face handwritten assessment modality, which can be done on the basis that it is the person involved who elaborated the self-declared piece of writing;

2. Allocate time for formative portfolio or project-based assessment types because these involve individual feedback that allows the teacher to check the learning trajectory of the students (although we know that this can be difficult in large classes).
3. Opt for kinds of assessment that cannot be answered by the AI, such as case studies, assignments based on what was discussed in class, and design of devices and materials that function as evidence of learning: paper posters, interactive presentations, etc.
4. Reflect on the importance of respecting academic integrity in the development of one's activities and work by valuing what has been learned.

Ideas for action

To implement with students:

- Generate workspaces with ChatGPT, or another similar generative tool, in the classroom: design *prompts*, evaluate the productions based on what has been discussed in class or in the bibliography, and debate on the quality of what has been produced. Even when chat prompts and questions are of poor quality (very basic, with little detail of what is expected) they serve to better structure the subsequent prompts.

- Devise classroom assignments with AI-generated texts that require modifying content, revising grammar, editing writing, changing register, checking and expanding sources, or validating content.

- Explore ways of extending automatically generated texts: add examples seen in class, summarise extensive or complex content. Tackle a topic seen in class and evaluate the quality of what has been produced. Consider ethical uses of the tools to encourage better learning, for example, by asking students to explain the fragments of an automatically generated production.

- Ask students to discuss what kind of tasks AI-based applications are most effective for: when and why to use them, what to use them for and in what context. For example, are the tools useful when we want to search for information on a topic, or when we already know the content but need to generate a specific text whose quality we can evaluate?

- When the generated text is far from the expected content, assess the quality of the provided *prompt*, reformulate it, analyse what information needs to be added to the request to obtain the desired result.

- Explore the possibilities of developing students' critical thinking through interaction with the tools. Consider questions about the nature of the technologies themselves in order to analyse the answers provided. We propose some examples to request information: What is the environmental cost of processing large volumes of information in terms of carbon dioxide emissions and water use for

server cooling? If, as we have seen, platforms already have algorithms embedded in their user profiling and recommendation systems, does the acceleration generated by generative technologies imply an increase and refinement of behavioural tracking and recording practices with the aim of making them predictable and monetisable (Magnani, 2021; Martínez Elebi, 2020)? How to maintain objectives of common good and educational justice in environments that prioritise commercial and data extractive logics (Artopoulos et al., 2020; Kerssens and Van Dijck, 2021)? How are developments in AI-based applications framed in a context of educational divides such as that in Latin American? With what criteria and from what perspectives are technologies designed and then exported to geographically and culturally distant regions? How does this design affect collectives with such diverse practices, identities and histories (see Costanza-Chock, 2020)?

To enhance teachers' experience:
- Experiment personally with the generation of texts that we use in our daily lives: requesting the writing of e-mails or messages to students, teachers and/or families, the resolution of activities that we usually share in the classroom, work with instructions in different formats and evaluation rubrics. Analyse the validity of the productions.
- Generate requests for the design of exercises or projects and evaluate their adaptation to various contexts. For example, in the case of creating true/false quizzes or multiple choice questions, and in the design of lesson plans and projects; tools often offer varying degrees of quality. Clarify the sections it should contain, the topic we need it to go deeper into, and regenerate the content until it 'fits' or comes as close as possible to what you need.
- Try generating teaching sequences or classroom materials that simplify concepts: paste a longer text and ask for synthesis in fewer words, ask for an adaptation for '13-year-old students'. With the right prompt, we can gradually obtain materials that can be adapted to our context.

For assessment:
- Agree with learners on what is expected of each task, and when and how to use automatic text generation tools. As with calculators and other electronic devices, their use is not always synonymous with enhancing learning. Choose instances of face-to-face work when the context requires it, so that pieces of writing are generated with evidence that they are indubitably their own, etc.
- Ask ChatGPT to solve activities that we normally include in our lessons and materials. Evaluate their potential and limitations. As far as possible, consider where it might be appropriate to revert to handwritten assessment in a

face-to-face modality. Consider whether these AI-generated responses could be included in an assessment to be reframed by students.

- Paste a text or another production elaborated by a student and request the writing of a feedback report: include assessment criteria, aspects to be taken into account and the expected structure of the report.

Tools for experimentation[1]

Perplexity: https://www.perplexity.ai/

It is a search engine that integrates conversational artificial intelligence technology, which makes it possible to maintain a more fluid dialogue with the search engine, and to display the sources where the information for the answers was taken from. These sources are updated in real-time.

ChatGPT: https://chat.openai.com/chat/

It is an AI chat platform developed by OpenAI. It allows users to interact with written artificial intelligence language models in real-time.

You.com: https://you.com/

It is a privacy-focused search engine that summarises results by website categories , unlike a traditional search engine that displays a list of links.

Dall-e 2: https://openai.com/dall-e-2/

It is an OpenAI application that uses artificial intelligence to generate images from text descriptions.

Bing: https://www.bing.com/new

It is a search engine that integrates conversational artificial intelligence technology and provides up-to-date and verifiable sources.

Twee: https://twee.com/

It is an AI-powered tool for English teachers. It allows you to design grammar activities in seconds.

Canva: https://www.canva.com/es_mx/generador-imagenes-ia/

It is a tool for designing presentations, posters and other visual designs that recently incorporated an AI image generator.

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[1] Adapted from Craig, D. (2023). *Computers that learn.*
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