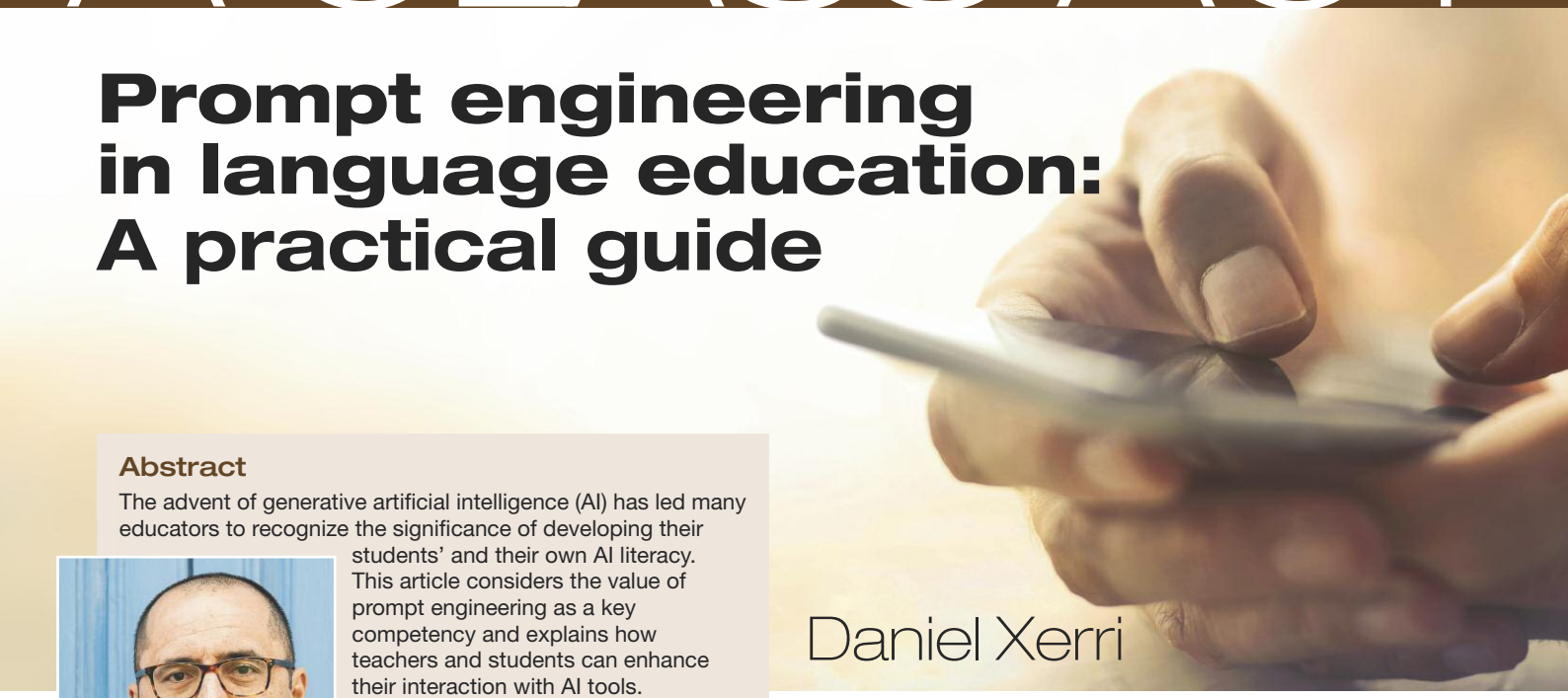
Prompt engineering in language education: A practical guide



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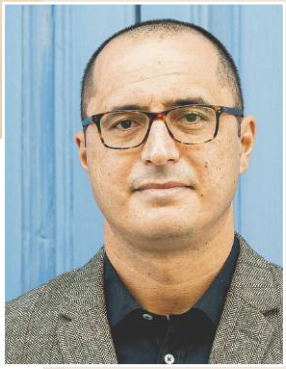
Abstract

The advent of generative artificial intelligence (AI) has led many educators to recognize the significance of developing their students' and their own AI literacy. This article considers the value of prompt engineering as a key competency and explains how teachers and students can enhance their interaction with AI tools.



Biography

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Introduction

With the widespread use of generative artificial intelligence (AI) in a broad range of social and professional domains, educators around the world have gradually realized that young people need to be equipped with a new set of competencies that facilitate the effective use of the AI tools currently available and those yet to be created. This is because of a growing awareness of several downsides to generative AI use on the part of both teachers and students. These include teachers' inadequate knowledge of AI and how AI could best be utilized, teachers' and students' insufficient awareness of the limitations and risks of AI, students' uncritical use of the technology and relying on it to do their thinking, and students' ineffective learning of new knowledge and skills through their attempts to minimize their work (Walter, 2024).

These downsides form part of a problem landscape that is characterized by a series of pitfalls, including AI hallucinations (where the technology invents things that are false), AI alignment (where the technology subtly disregards instructions and acts independently), and AI discrimination (where the skewed data used to train existing large language model leads to biased results) (Walter, 2024). The latter issue has led to the coinage of the acronym WEIRD, which stands for data samples sourced from Western, Educated, Industrialized, Rich and Democratic countries (Septiandri et al., 2024). Without an awareness of these pitfalls, users of generative AI are likely to see the technology as a truth generator rather than a statistical machine (Walter, 2024). The concerns emanating from these problems are leading increasing numbers of educators to embrace the idea that what is required in the classroom is focusing on cultivating a critical analysis of AI.

AI literacy

As a multi-dimensional notion, AI literacy is constituted by the elements that people require to interact with the technology productively (Kong et al., 2024). The concept is considered vital because it helps to enable a society's citizens to contribute effectively to it in their personal and professional lives (Kong et al., 2024). Stolpe and Hallström (2024) affirm that AI literacy must form part of students' extensive technological multiliteracy because, at this juncture in humanity's relationship with technology, it seems impossible to imagine a future that will not be radically transformed by AI developments.

Different AI literacy frameworks have been proposed over the past few years and in most cases share certain key components. For instance, Ng et al.'s (2021) framework consists of four levels of competence: know and understand AI; use and apply AI; evaluate and create AI; and AI ethics (see Figure 1).

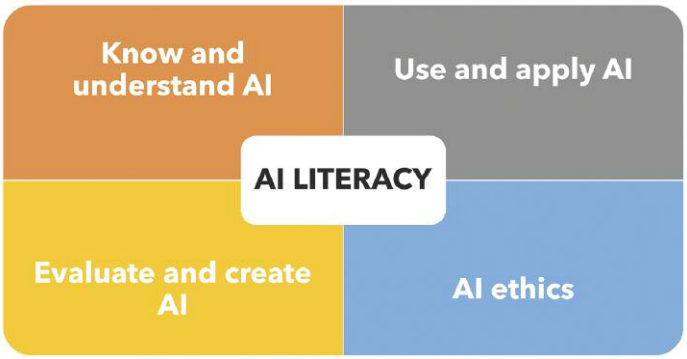

Figure 1: Ng et al.'s (2021) AI literacy framework

The first aspect of AI literacy development concerns knowledge of the technology's basic functions and the use of different kinds of AI (Ng et al., 2021). This is followed by the application of AI knowledge and concepts in diverse scenarios. The third aspect is made up of the deployment of higher order thinking skills in the use of AI applications. The last aspect of AI literacy in Ng et al.'s (2021) framework consists of a person's consideration of ethical principles such as fairness, accountability, transparency and safety when using AI.

A similar framework is that proposed by Hibbert et al. (2024). Heavily influenced by the revised version of Bloom's taxonomy of educational objectives (Anderson & Krathwohl, 2001), this framework also consists of four levels: understand AI; use and apply AI; analyse and evaluate AI; and create AI (see Figure 2).

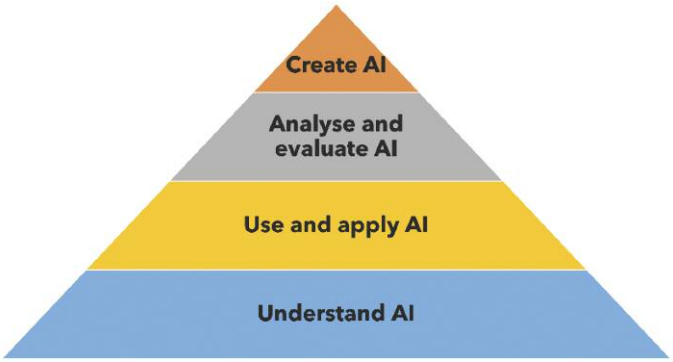

Figure 2: Hibbert et al.'s (2024) AI literacy framework

For each one of these progressively more challenging levels, Hibbert et al. (2024) propose a series of questions that are meant to help people reflect on their interaction with the technology. These are some examples:

- Understand AI: what might this tool be particularly useful for?
- Use and apply AI: how could the prompt be adjusted to get a different response?
- Analyse and evaluate AI: where might any biases in AI output come from?
- Create AI: what specific AI features lend unique affordances to ideas, technologies or structures? (Hibbert et al., 2024)

While the last level requires competencies that are of a more technical nature (e.g. coding), the first three are probably within the ability of most teachers and students since they involve competencies that are either associated with existing digital literacy and soft skills or build upon them.

Some educational institutions around the world are giving so much importance to their teachers' and students' AI literacy that they have sought to map these competencies. For instance, these are some of the core competencies proposed by Newcastle University (2024) in the UK:

- Recognize AI when you are interacting with it in existing and new platforms
- Develop a basic knowledge of how different types of AI work and the human role in AI
- Critically analyse what AI can do and distinguish between types of AI
- Develop an awareness of what AI might be able to do in the future
- Identify the strengths, weaknesses and limitations of AI
- Develop a critical awareness of how computers learn from data and the impact this has
- Describe the key ethical issues surrounding AI and its use in education including for academic integrity
- Critically evaluate information generated by AI and make informed decisions about its use in your work
- Communicate successfully with AI including creating effective prompts

The last competency in this list forms part of the second level of AI literacy in the two frameworks discussed above. Now referred to as prompt engineering, it involves experimenting with the production of prompts and refining prompt language to enhance AI-generated output.

Prompt engineering

As a competency that has the potential to elevate understanding of generative AI from an information repository to an interactive technology that boosts deeper forms of learning (Walter, 2024), prompt engineering is valued for its capacity to improve accurate use of AI, save time, facilitate complex tasks, enhance user experience and produce better outcomes (DigitalOcean, 2024).

To help us understand what prompt engineering involves, it is important to consider first what constitutes a prompt. As an instruction we issue to generative AI, a prompt can be as simple or as complex as the user decides. For Uspenskyi (2024), the four components of a prompt are agenda, instruction, trigger and format. The first consists of the contextual information that we use to prime the AI (e.g. "Imagine you are a teacher of English teaching a B2 class at a school in Geneva."). The instruction is what we tell the AI to do or the information we want it to give us (e.g. "Design a lesson to help students practise inferencing skills."). The trigger consists of examples we want the technology to consider or build upon when generating the output (e.g. "The students are particularly interested in popular science and enjoy reading magazine articles."). Lastly, the format is what we want the output to look like, whether it is continuous prose, bullet lists, a multimodal text, etc. (e.g. "The lesson materials should include three multiple choice tasks of four options each.").

When formulating a prompt, it is crucial to allow one's practices to be guided by certain key principles. While clarity, conciseness and relevance might seem obvious, one of the mistakes that some generative AI users typically make is to assume that the technology can read their minds and understand their intentions irrespective of how incoherent their prompt is. The technology company and cloud service provider DigitalOcean (2024) proposes the following best practices:

- be as specific as possible (context, format, length, level of detail, tone and style, comparisons and examples)
- supply the AI with examples (sample texts, data formats, templates, graphs and charts)
- specify your desired output
- provide instructions on what to do instead of what not to do (e.g. "Provide a concise summary," instead of "Don't write too much detail.")
- give the model a persona or frame of reference
- split complex tasks into simpler ones
- understand the model's shortcomings

While the last point might not seem pertinent to prompt engineering, it is a valid observation given that when people use generative AI, they need to be aware that the technology has its limitations and might sometimes be unable to fulfil their requests in the way they expect. These limitations are compounded even further if a user's knowledge of how to produce prompts is superficial.

Prompt methodologies

All prompts are equal, but some prompts are more equal than others. This implies that there are a range of ways in which people can interact with generative AI, but some of them have additional benefits and can empower their users further. Walter (2024) identifies seven different prompt methodologies (see Table 1).

Table 1: Walter's (2024) classification of prompt methodologies

Input-output prompting	The classic form of prompting: simple input, simple output.
Chain-of-thought prompting	The AI should slowly elaborate on how a given response is generated.
Role-play or expert-prompting	The AI should assume the role of a person or an expert before providing an answer.
Self-consistency prompting	The AI should generate several responses and discern itself which would be the best answer.
Automatic prompt engineer	The AI model is provided with several examples, and it should help us find an ideal prompt to arrive at these examples.
Generated knowledge prompting	Before prompting the AI with our actual task, we first let the model generate knowledge about the topic so that it has already set the right scene for its responses.
Tree-of-thought prompting	The AI is provided with a complex setting where it is prompted to use its arguments like a chess game, providing several lines of thought and going back again if there are inconsistencies before eventually converging on the best response.

To illustrate what some of these methodologies look like, ChatGPT was asked to formulate examples of the first four in the context of English language education. In the case of input-output prompting, the prompt would be something simple like this: "Produce a lesson plan to help me teach the present perfect." A chain-of-thought prompt is far more complex but still adheres to the principles outlined above. The final part of the prompt is vital because it asks the AI to explain the reasoning behind the generated output.

> You're teaching a class of intermediate-level English learners about the differences between the past simple and present perfect tenses. Create a lesson plan that explains when to use each tense, includes examples, and finishes with an exercise for students to practise. Provide the rationale behind each part of your lesson.

Role-play or expert-prompting is not necessarily more complex, but the key element is that the AI is asked to adopt a clear role.

> You are an English language teacher preparing a lesson for upper-intermediate students on the topic of reported speech. Your goal is to ensure students understand how to transform direct speech into reported speech. Create a detailed lesson plan that includes the following:
>
> 1. Explanation of the concept: how would you introduce reported speech to students?
> 2. Examples: provide clear examples of transforming direct speech into reported speech.
> 3. Common mistakes: identify and explain common errors students might make and how to address them.
> 4. Practice activity: design an interactive exercise or activity that will help students practise converting direct speech to reported speech.
> 5. Assessment: suggest a method to assess student understanding at the end of the lesson.

In the case of self-consistency prompting, it is important to ask not only for multiple examples but also to ask for a rationale from the AI. In certain cases, this kind of prompting might work best if the AI is instructed to do several things following an order of progression.

> Generate three definitions of "collocations" and explain which one is best.
>
> Definition 1: Collocations are pairs or groups of words that are frequently used together in a language, forming common and often predictable word combinations.
>
> Definition 2: Collocations refer to the habitual juxtaposition of a particular word with another, with the resulting combination often conveying a meaning that cannot be deduced from the individual words alone.
>
> Definition 3: Collocations are words that tend to occur together more often than would be expected by chance, and are often used in natural, idiomatic language.

After providing the above three definitions, ChatGPT explained the significance of each one.

> Definition 1 is straightforward and emphasizes the frequent usage of word pairs or groups, focusing on the idea that these combinations are common and predictable.
>
> Definition 2 adds the concept of *habitual juxtaposition*, suggesting that the combination of words is not random, and highlights the potential for these combinations to convey unique meanings that differ from the individual words.
>
> Definition 3 introduces the idea that collocations occur more often than chance would suggest, pointing out their role in natural and idiomatic language, but it is somewhat vague and less direct in conveying the idea of habitual combinations.

After explaining the definitions, ChatGPT analysed each one and justified why the second one was the best. While not everyone might agree with this determination, what is noteworthy is that the AI simulated an analytical process and made an attempt to rationalize its response.

> Definition 2 is the most comprehensive and precise. It not only explains that collocations involve words that are commonly used together, but it also introduces the idea that these combinations are habitual and can convey meanings that are not simply the sum of their parts. This definition captures both the frequency and the unique meaning that collocations can embody, making it the most informative and complete.

Conclusion

Whether seeking to develop their own ability to engage in prompt engineering or that of their students, teachers need to remember that it is an iterative process consisting of several steps. It makes sense to start by being clear about one's goals before drafting an initial prompt. After testing the prompt, one has to evaluate its output. Based on the value of this, one proceeds to a refinement of the prompt and a repetition of the cycle if so required.

Prompt engineering is currently being given a lot of importance because of how it can transform people's way of interacting with generative AI. However, the emphasis we place on the development of this competency should not be at the expense of other instrumental future skills. In fact, while suggesting that the hype surrounding prompt engineering may be short-lived, Acar (2023) maintains that "A more enduring and adaptable skill will keep enabling us to harness the potential of generative AI. It is called problem formulation — the ability to identify, analyse, and delineate problems." This is aligned with the idea that while several existing educational programmes concentrate on digital or AI skills, few acknowledge the significance of transversal competencies and other complementary skills (OECD, 2023).

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