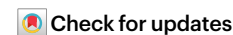


Overcoming the language barrier in science communication



Scientific knowledge is mostly communicated in English, which may pose a barrier for non-native English speakers in writing and talking about their research. However, scientific communication can be improved by following some simple rules and by taking advantage of new and existing tools.

Diversity enriches science, whereby researchers from different ethnicities, backgrounds and cultures contribute to a more dynamic, innovative and tolerant scientific environment¹. Language shapes our way of thinking^{2,3}, and scholars with different mother tongues can introduce various perspectives and ideas, which are key to research advancements and breakthroughs⁴.

However, most scientific publications, and many conferences and seminars, are conducted in English. Although a common language facilitates communication among scientists worldwide, it can present a barrier for non-native English speakers. Early-career researchers may struggle to master scientific writing in English to clearly communicate the impact of their work, which may introduce an additional challenge when seeking to publish their research and advance their careers. In addition, teaching lectures in English to a multilingual class can put pressure on non-native English speakers. In this issue, [Hagar Labouta](#) shares her experience as a science educator and discusses the key elements to consider in a multilingual and multicultural science classroom.

Whether native English speaker or not, clear and non-ambiguous writing is key to communicating science. Encouragingly, scientific writing can be improved by following a few rules and keeping it simple. When communicating your research, keep in mind that the reader or listener always has four key questions in mind.

Why did you do the study? Provide the context of your research (that is, set the stage), and clearly state the knowledge gap or question that your work is addressing.

What did you do? Explain the methods that you have applied, providing enough detail so that others can reproduce your work. Of course, in a conference talk, you may want to keep it simple, outlining key methodologies.

What did you find? Explain (not just list) your key results, comparing them with previously published work, and extracting the key information.

How does the study advance the field? Discuss who else could benefit from your work and provide the bigger picture of how your results and insights can advance this and other fields.

“Scientific writing can be improved by following a few rules and keeping it simple”

Importantly, whether you are writing a research or a review article, always aim for a broad audience, keep the language simple, use acronyms sparingly, and avoid ambiguities (make sure it is clear whether something has previously been published or whether it is a hypothesis). Simplicity is key, as you do not want readers to require a dictionary to read your paper. Avoid redundancies but explain concepts that are important to understand your work in sufficient detail.

When it comes to grammar and style, tools can aid in developing and improving scientific writing skills; for example, [Grammarly](#) can be applied to correct spelling, grammar, punctuation and improve clarity. [CoSchedule](#) can assist in writing titles. The [Hemingway Editor](#) can detect lengthy, complex sentences and common errors, and [Quillbot](#) can be used as a paraphrasing tool.

Artificial intelligence technologies, such as the chatbot [ChatGPT](#), can draft abstracts, generate titles or make text more readable. For example, ChatGPT can be applied to obtain a clean and clear version of a manuscript draft. At Springer Nature, large language models, such as ChatGPT, are currently **not accepted as a credited author**; however, researchers can use such tools, but need to document their use in the methods or acknowledgements. These tools are a work in progress though, and their implications on scientific writing remain controversial⁵. Whether large language models become **a game changer in scientific writing** remains to be seen; however, ultimately, our language serves as a means of expression, which should not be lost in the quest to perfectionate writing in English.

At *Nature Reviews Bioengineering*, we are a team of non-native English-speaking editors, with mother tongues as diverse as Arabic, Farsi, Italian and German. Building on this diversity, we are committed to supporting researchers in communicating their science by editing their review articles, essentially applying the aforementioned rules, and delivering workshops on scientific writing, with the aim to improve scientific communication, while fostering and preserving the diverse ways of communication in our multilingual community.

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