



Tips for Effective Scientific Writing

Glen P. Jackson

1. Write in paragraphs that build coherent blocks of thought. Each paragraph should provide logical arguments that support a statement or idea. The statement or idea you are describing or defending should be clearly worded in a topic sentence, which is best placed at the beginning of the paragraph. Notice that the first topic sentence in this paragraph is very simple, and the remaining sentences all describe or support the first statement.
2. Use short declarative sentences and avoid flowery or unnecessary expressions. Examples of unnecessary expressions to avoid are:

In order to; It is shown that; It can be noticed that; It has to be mentioned that; It should however be noted that; It is clear that; Regarding this fact that; It is given by the fact; Based on our experiments/understanding; As can be seen from Figure (table); It takes into account the fact that; It is identified that.

Such expressions can usually be deleted without altering the message.

3. With the possible exception of the experimental section, always write in the active voice and not the passive voice. Passive voice often shows up with the words *was* or *were* and often with verbs ending with *ing*. In the passive voice, one usually cannot tell who or what is making the action happen. Learn to write in a style where subjects or nouns directly act on other nouns.

Not: The two solutions *were mixed*, and a blue color *was observed*.

But: The reaction mixture *turned* blue.

Not: A needle valve *was used* to regulate the pressure.

But: A needle valve *regulated* the pressure.

Not: No evidence *was found* that A caused B.

But: A *did not cause* B.

4. Use specific and quantitative comparisons instead of vague or subjective comparisons:

Not: The crystals grew *larger over time* until they were *really big*.

But: The crystals exceeded 50 micrometers in length in less than five minutes.

Not: The reaction rate *increased* at higher temperatures

But: The reaction rate *doubled* from 40 to 60 °C.

Forbidden words! The following terms are vague, weak and subjective, so consider them *forbidden terms*, unless they are used with additional quantitative qualifiers or context.

Very, not very, big, small, large, little, nice, good, bad, better, worse, okay, quite, really, got, get, low, high, believe, think, this, that, these, those, it.

5. Avoid starting sentences with vague pronouns like *this, these* or *it* (<https://writingcommons.org/article/clarify-vague-pronoun-references/>). Instead, either use the name of the actual noun or subject, or, at an absolute minimum, provide the noun after the pronoun.

Not: *This* is because the temperature was *higher*. (also contains a forbidden term!)

But: *This enhancement* was caused by a temperature increase of 10 °C.

Not: *These* are always found together. (also contains the passive voice).

But: *The two stereoisomers* always occur together.

6. Always have a space between numbers and units and use units in a manner consistent with IUPAC conventions.

E.g., 5 m/s or 5 ms⁻¹; 22.4 g/mol; 43 kg; 5.4x10⁻³ Pa, 45 F, 78 °C

E.g., Exceptions: 54%, 360° (degrees in a circle)

7. Never use two spaces after a period, comma or ever! (<https://slate.com/technology/2011/01/two-spaces-after-a-period-why-you-should-never-ever-do-it.html>).
8. Only use parentheses to cite figures/tables, to cite companies or manufacturers (Thermo Fisher Scientific, Palo Alto, CA) or to provide an abbreviation for the first time you introduce an abbreviation. If information is important enough to include in a passage, provide the information outside of any parentheses.

Not: Several classes of compounds have been successfully detected on fingerprints including drugs (*both over the counter and illicit*) and explosives.

But: Several classes of compounds have been successfully detected on fingerprints, including illicit drugs, over-the-counter drugs and explosives.

E.g., A plot of instrument response versus quantity injected provides a ~~good~~ linear response with an R² exceeding 0.95 (Figure 2).

E.g., ...as determined by the Fourier Transform Infrared (FTIR) Spectrometer (PerkinElmer, Waltham, MA).

9. Use existing conventions and don't make up your own rules! Use existing style guides (e.g. <https://pubs.acs.org/doi/book/10.1021/acsguide>). This rule applies to: formatting documents; formatting citations; designing and labelling graphs and charts; organizing figure legends in, above or below figures; writing sentences; using mathematics; conducting experiments; proposing acronyms. It is your job to become informed about conventions in your discipline!

10. Avoid double negatives. The affirmative is faster and easier to understand.

Not: We *never doubted* that...

But: We *trusted* that...

Not: Do *not forget*

But: Remember

Not: ...is *not a bad* way to...

But: ...is *useful* to...

11. Learn to use terms correctly. When using comparison terms like “larger”, you have to provide the comparison. *While* means *at the same time*, not *in contrast to*. *Over* means *above*, not *greater than*.

Not: *While* A happened, B did not occur.

But: *Whereas* A happened, B did not occur.

Not: After mixing, *over* 200 grams of reagent were added to the mixture... (which is also passive)

But: After 2 minutes, *more than* 200 grams of reagent reacted with...

Or: The addition of 200-250 grams of reagent after 2 minutes of mixing completed the reaction.

12. Use commas correctly. Use commas to separate independent clauses when they are joined by any of these seven coordinating conjunctions: *and*, *but*, *for*, *or*, *nor*, *so*, *yet*. Remember, an independent clause can form a grammatically complete sentence by itself. If the clause is not independent, you do not need a comma.

Not: The results demonstrate that the LODs are better with the new extraction technique and the sensitivity is also better. (also contains the vague, forbidden terms “better” and no comparison)

But: The results demonstrate that the LODs are 3 times better with the new extraction technique relative to SPE, and the sensitivity is improved by a factor of 2.

Or: Relative to the previous approach, the new extraction technique improves the LODs and sensitivity by factors of 3 and 2, respectively.

13. Use the term *use* for normal uses of tools/approaches. Use the term *utilize* when tools/approaches are used for uncommon or unintended applications. (<https://grammarist.com/grammar/use-vs-utilize/>)