

Chapter 5

Mechanics

This chapter summarizes some mistakes that students, and also more experienced academic authors, commonly make in their papers. They are mostly related to grammar, punctuation and technical notation. They may seem trivial, but if you get them wrong you will distract, mislead, and slow down your readers.

Some, but not all, of these “mechanical” mistakes are grammatical; we will start with these. Others concern constructs that are grammatically correct, yet are still not as clear and concise as possible.

5.1 Basic Grammar

The rules of grammar tell us how sentences are structured. English grammar is a lot more fluid than that of many languages, but there are still rules that should never be broken, and other that should be broken only with caution, and after you have given a lot of thought to the alternatives.

5.1.1 Singular and Plural

Verbs should match the noun, not the adjectival phrase’s noun:

✗ DON’T: This set of guidelines are useful.

The noun here is “this set”, which is singular. We could change the noun to be plural:

✓ **DO:** These guidelines are useful.

or change the verb to be singular:

✓ **DO:** This set of guidelines is useful.

“None”, like “one”, is singular:

✓ **DO:** None of the available programs works

Pronouns should match the original noun:

✗ **DON'T:** The operating system is the first bastion of defense against the hacker. Keep them up to date.

✓ **DO:** Operating systems are the first bastion of defense against the hacker. Keep them up to date.

Alternatively:

✓ **DO:** The operating system is the first bastion of defense against the hacker. Keep it up to date.

5.1.2 Past and Present Tense

Be consistent in tense throughout the paragraph, except when the action clearly moves from the past to the present or future.

✓ **DO:** We administered the questionnaire to 16 subjects. Based on the results, 3 of them were disqualified from the study.

✗ **DON'T:** Call-by-name was replaced by call-by-reference. Call-by-name is more expensive to implement.

✓ **DO:** Object-oriented databases were popular in the 1990s, but are now out of favour.

5.1.3 Articles

Use “a” or “an” are *indefinite* articles; use them when you are talking about a generic object. The choice between “A” and “An” depends on the *sound*, not the spelling, of the noun:

✓ **DO:** a university

✓ **DO:** an honour.

This works for abbreviations too:

✓ **DO:** an MP

✓ **DO:** a member of parliament.

Adjectives change the sound, so they change the article too:

✓ **DO:** a table

✓ **DO:** an unusual table.

In contrast, “the” is the *definite* article; it is used to indicate a specific object. So, if we are going to see some unspecified movie, we say

✓ **DO:** Tonight we are going out to see a movie.

and not

✗ **DON'T:** Tonight we are going out to see the movie.

The latter form is appropriate when we have been discussing some specific movie. If you are not sure which form to use, ask yourself whether or not the identity of the thing (in this case, the identity of the movie) clear from the context?

We also use *the* in front of a noun-phrase that designates a unique person or thing:

✓ **DO:** Tonight we are going to see the top movie of 2013.

✓ **DO:** Because he broke an egg on the head of a classmate, Jennings was told to see the headmaster.

Notice: *an* egg, and *a* classmate; there are many eggs and many classmates, and we are not specifying which one. However, there is just one headmaster, hence the use of *the*.

5.1.4 You Have Two Hands

If you want to use the phrase “on the other hand”, it must be preceded by “on the one hand”. If you don’t want to start your comparison with “on the one hand”, then introduce the opposing situation with an alternative prefix, such as “In contrast”.

✓ **DO:** On the one hand, moving out of town would save money. On the other hand, it would be a pity to leave our neighborhood.

✗ **DON'T:** Directed reading courses allow us to offer a variety of topics. On the other hand, they require more commitment from the students.

✓ **DO:** Writing with google docs is like playing a video game. In contrast, writing with L^AT_EX is like programming.

5.2 Spelling

Use a spellchecker, but don't take it for granted. All the spellchecker checks is whether or not a word is in the dictionary: it does not check that the word is the correct one in its context. For example, *therefore* and *therefor* are both English words, and both will pass the spell-check. Do you know which to use in your sentence?

✗ **DON'T:** We revised the submission cite to list the new deadlines.

Some words have alternate spellings—for example, modelling can be spelled with one or two *l*s. It doesn't really matter which you choose, but it is important to be consistent throughout your paper.

American English and British English frequently differ in spelling. British English is preferred not just in Britain, but in most European venues, and also in former commonwealth countries such as New Zealand and Australia. If you are a U.S. author, and are submitting to a U.S. conference or journal, then you would normally use American spelling. The exception would be when the majority of your co-authors are European.

If you are submitting to an European conference or journal, but are based in the U.S., you can still get away with using American English; some of the reviewers may comment on it, but they won't reject your work for this reason. However, if you have one or more co-authors from outside the U.S., then use British English. You can typically tell your spell-checker which dictionary to use.

5.2.1 Confusable Word Pairs

Pairs of words that are close in spelling but different in meaning can easily be confused. It's good to check these by eye; they won't be picked up by spellcheckers (and may not be noticed by grammar checkers).

affect and effect: Affect is a verb meaning "to influence".

✗ **DON'T:** Background noise effected the quality of your results.

✓ **DO:** The network load affected the available bandwidth.

Effect is usually a noun meaning "a result" .

✗ **DON'T:** The network load had no affect on bandwidth.

✓ **DO:** The network load had no effect on bandwidth.

Less commonly, “effect” is a verb meaning “to cause something to occur,” as in, “The cheerful music effected a change in Joe’s bad mood.” It might be best to avoid using it as a verb unless nothing else works.

✗ **DON'T:** The cheery music effected a change on Joe’s bad mood.

✓ **DO:** The cheery music caused a change on Joe’s bad mood.

✓ **DO:** The cheery music changed Joe’s mood for the better

Likewise, “affect” is can also be a noun, used mainly in psychology, meaning “the experience of emotion”. It is rarely in this way in ordinary English.

✗ **DON'T:** Joe had a sour affect. (Correct but confusing.)

✓ **DO:** Joe was in a bad mood.

stationary and stationery: Stationary is an adjective, meaning “not moving”, or “immovable”.

✓ **DO:** As the name implies, “base stations” are stationary.

Stationery means paper (and envelopes) for writing letters: ✓ **DO:** The love letter was written on perfumed stationery.

✗ **DON'T:** You can use \LaTeX to print your own stationery.

To remember the difference, remember that “e” is for “envelope”.

complement and compliment: Complement means “goes well with” or “pairs with” something. Compliment means “praise”.

✓ **DO:** The white wine complemented the halibut steak.

✗ **DON'T:** The TA and professor complimented each other’s skills.

✓ **DO:** I complimented the professor on her choice of examples.

alternate vs. alternative: alternate means to switching between two things in a regular pattern.

✓ **DO:** In double-buffering, the output alternates between *BufferA* and *BufferB*.

An alternative is a choice besides the one given.

✓ **DO:** If the output buffer is full, an alternative way of displaying an error message is to write directly to the console.

its vs. it's *Its* is a possessive pronoun, like *his* and *hers*. In contrast, *it's* is a contraction of “it is”, in the same way that “doesn't” is a contraction of “does not”. It is best to avoid contractions in technical writing.

The confusion between these words probably derives from the use of 's to make *nouns* possessive.

✓ **DO:** The book's cover was worn from years of use.

✓ **DO:** Its pages were clean and unmarked.

principle vs. principal A *principle* is a rule, as in *Archimedes' Principle*. A *principal* is the most important thing or person. Remember: it's a good idea to make the *principal* your pal.

imply vs. infer (see Dupré [1, §64]): A writer or speaker *implies* something when they hint at it without being explicit.

✓ **DO:** When you said “You took the money”, were *you* implying that I was a thief?

A reader or listener *infers* when they conclude that what they have read or heard has a meaning that goes beyond the obvious.

✓ **DO:** When you said “You took the money”, *I* inferred that you were accusing me of theft.

Notice that the *speaker implies* while the *listener infers*.

deduce vs. induce (*ibid*): When you *deduce* something, you are applying a general principle to a specific situation. This is sound reasoning. Induction works the other way: you *induce* a general principle from a few examples. Induction and inference mean roughly the same thing; you can also use *infer* for the act of going from the specific to the general.

5.2.2 Count Nouns and Mass Nouns

Some nouns indicate a “mass” of indistinguishable parts. For example, “Water” is a mass noun: you can weigh it, but you can't count it. Time and space are also mass nouns (even though they have no mass!).

With count nouns we use the words “many” and “fewer”

✓ **DO:** Many people filled the square.

✗ **DON'T:** How much people attended the inauguration?

✓ **DO:** B+-trees use fewer index pages than B-trees

With mass nouns we use the words “much” and “less”

✓ **DO:** How much water do we have?

✓ **DO:** The cyclic data structure used less space than the acyclic one

Notice that it is the noun (that is, the *word*) and not the *concept*, can be counted or weighed. So, while money and space are mass nouns, coins and bytes are count nouns.

✓ **DO:** I had less money than my friend.

✓ **DO:** I had fewer coins than the vendor.

✓ **DO:** The cyclic data structure used fewer bytes...

5.2.3 Two vs. Three or more

When comparing *two* things, we use comparatives, usually ending in “er”. For three or more things, use superlatives, usually ending with “est”.

✓ **DO:** Mergesort is usually slower than Quicksort,

but

✗ **DON'T:** We tested six algorithms; Bubblesort was consistently the slower.

✓ **DO:** Of the ten algorithms we analyzed, Mergesort is the fastest.

Choose *between* two alternatives, but *among* three or more possibilities.

✗ **DON'T:** I had difficulty choosing among the two colors.

✓ **DO:** I had difficulty choosing between the two titles.

✓ **DO:** Among all six flavors, I like chocolate the best.

5.2.4 Parallelism

When you express two or more similar ideas, use similar words. The rule is *keep parallel clauses parallel*, and lists homogeneous.

Maintaining parallelism means using the same form and structure for related elements. For example, if you choose a question for the title of Subsection 2.1, you should also use a question for subsections 2.2 and 2.3, and not make 2.2 an assertion and 2.3 an imperative.

- ✓ **DO:** 2.1 Should you build your own house?
- ✓ **DO:** 2.2 Should you repair your own car?
- ✓ **DO:** 2.3 Should you dig your own well?

This example is not advocating that you use questions as section headings; while they can be effective, they can also be tiresome. It might be better to use

- ✓ **DO:** 2.1 Building your House
- ✓ **DO:** 2.2 Repairing your Car
- ✓ **DO:** 2.3 Digging a Well

What parallelism excludes is mixing the various forms:

- ✗ **DON'T:** 2.1 The Pros and Cons of Building your own House
- ✗ **DON'T:** 2.2 Car repair for Beginners
- ✗ **DON'T:** 2.3 How to Dig a Well

Another application of the parallelism rule is to use parallel clauses within a sentence. When in doubt, make separate sentences in your head.

✗ **DON'T:** We can solve the problem by making the input file name the default, or select the previous output file when none is specified

✓ **DO:** We can solve the problem by making the input file name the default, or by selecting the previous output file

You should also use parallel constructions in adjacent sentences or paragraphs, when they express similar or contrasting ideas. Dupré discusses this topic at length [1, §85].

5.3 Clear Writing

5.3.1 Word Choice

Term Consistency

In technical writing, use the same term consistently. If you list six *objectives* in your introduction, continue to call them *objectives* throughout the paper; don't switch to *goals* in Section 2 and *principles* in the conclusion. Yes, this is boring, but it's also clear. Find other ways to make your writing interesting; for example, write interesting content!

“Like” vs “Such As”

See Dupré [1, §27]. “Like” means similar to, but not the same as. Use it when the specific example you give is *not* an acceptable answer.

✓ **DO:** I'm looking for a shrub like a Hydrangea, but with evergreen leaves.

A Hydrangea is *not* an evergreen, so it is not a satisfactory choice.

✗ **DON'T:** To prepare our papers, we considered using a text processor like L^AT_EX.

L^AT_EX is a text processor, so “such as” is the right phrase.

“Which” vs. “That”

“Which” and “that” are not interchangeable. “Which” is normally preceded by a comma, and introduces a short *description* of the thing in question.

✓ **DO:** The lawnmower, which is in the garage, is broken.

This sentence would mean the same thing without the parenthetical phrase “, which is in the garage,” — but it might take you longer to locate the broken lawnmower.

In contrast, “that” is not preceded by a comma; the phrase introduced by “that” *defines* the thing in question.

✓ **DO:** The lawnmower that is in the garage is broken.

Here the information contained in the defining phrase “that is in the garage” is essential; the implication is that there is more than one lawnmower, and the one in the shed works just fine.

✓ **DO:** The dinner, which was prepared by an expert chef, began at 9:00pm.

✓ **DO:** The dinner that was prepared by an expert chef began at 9:00pm.

Again, the implication behind the second sentence is that there were other

dinners, and that the amateur chefs were able to serve their meals in a more timely fashion.

Don't precede "that" by a comma; your readers will be confused whether you are defining or describing. See Dupré [1, §17], and Fowler [2, "that, rel. pron. 1"].

5.3.2 Word Placement

Word placement is critical to writing clear English. Because English is not an inflected language, word placement can be critical to clarity. Poor placement leads to ambiguity, and can leave the audience confused. Here are some examples to give you the idea.

Placement of "above" and "below"

Above and *below* follow the word that they describe:

✗ **DON'T:** The below item is frequently ignored, to the detriment of clarity.

✓ **DO:** The item below is frequently ignored, to the detriment of clarity.

Dupré [1, §48] argues that we should instead use more precise terms.

✓ **DO:** Computer scientists frequently ignore the following item, to the detriment of clarity.

Placement of "only"

Only qualifies the word that immediately follows.

✗ **DON'T:** You took out the garbage this morning only.

All of the following are correct—but note how they differ in meaning!

✓ **DO:** *Only* you took out the garbage this morning.

✓ **DO:** You *only* took out the garbage this morning.

✓ **DO:** You took out *only* the garbage this morning.

✓ **DO:** You took out the garbage *only* this morning.

For further discussion, see Dupré [1, §5]. For another instructive example, consider the possible placements of *only* in the phrase: "Yesterday I hit the man in the eye."

Split Infinitives

An infinitive is a verb form that can act as a subject or object, as in “to be” or “to laugh.” A split infinitive occurs when the speaker places another word, typically an adverb, between “to” and the verb. Split infinitives are poor grammar, but they may be better than some of the alternatives.

✗ **DON'T:** It is not good policy to incessantly criticize your students.

✗ **DON'T:** To boldly go where no adverb has been before.

✓ **DO:** It is good policy to provide students with appropriate feedback, both negative and positive.

✓ **DO:** It is good to laugh.

For further discussion, see Dupré [1, §38] and Fowler “Out of the frying pan” [2].

5.3.3 Non-referential Pronouns

Pronouns, such as “this” “that” or “it”, *must* refer back to noun. This is normally the *most-recently mentioned* noun. The meaning of a pronoun may be clear to the writer at the time it is used, but can leave the reader confused. For example:

✗ **DON'T:** Reducing the number of service queues increases average delay and reduces the number of idle periods. This affects the recovery subsystem.

Clear up the confusion with more specific language:

✓ **DO:** Reducing the number of service queues increases average delay and reduces the number of idle periods. The reduction in idle periods affects the recovery subsystem.

5.3.4 Lists

Lists are assumed to be complete, unless the author indicates otherwise.

✗ **DON'T:** Programming environments—Eclipse, XCode, BlueJ — improve programmer productivity.

✓ **DO:** Programming environments—Eclipse, XCode, BlueJ, *etc.* — improve programmer productivity.

✓ **DO:** Examples of programming environments are Eclipse, Xcode and BlueJ.

Note that one needs to indicate that the list is incomplete only once; additional indications are redundant and should be removed. So, if you start the

list with “examples of”, *don't* also add “*etc.*”

✗ DON'T: Examples of programming environments are Eclipse, Xcode, BlueJ, *etc.*

5.3.5 Use of Jargon

Jargon is endemic in technical communication, and so it can be difficult to realize when one is using jargon in academic writing. Nonetheless, one must take care to limit use of jargon, because jargon can confuse outsiders. Consider having an outsider read the document and point out jargon.

✗ DON'T: “We had a high-bandwidth conversation with our users.”

✗ DON'T: “Our survey showed most administrators bounced the server to resolve the problem.”

✓ DO: “We had an intensive, probing conversation with our users.”

✓ DO: “Our survey showed most administrators power-cycled the server to resolve the problem.”

5.3.6 Use of Latin

Latin makes one’s writing harder to understand, but there are rare exceptions where a Latin phrase is acceptable. The phrase “*et cetera*” (or “*etc.*”) is still in common use even outside academia, and can be treated as English. The phrase “*et al.*” is acceptable because it’s commonly used in academic literature, but one may also elect to use an English equivalent such as “and colleagues.” Whether one chooses to use “*et al.*” or “and colleagues,” one should consistently continue to use that phrasing through the entire work, and in one’s bibliography.

✗ DON'T: Functional languages, *e.g.* Scheme and OCAML, often find use in artificial intelligence programming.

✓ DO: Functional languages, *such as* Scheme and OCAML, often find use in artificial intelligence programming.

✗ DON'T: *NB:* we still haven’t shown that the smart card’s cryptographic algorithm is in fact linear.

✓ DO: *Note:* we still haven’t shown that the smart card’s cryptographic algorithm is in fact linear.

5.4 Style and Notation

5.4.1 Citations

Writers often treat citations as nouns. In fact, they are not nouns; they are parenthetical statements, and should be treated as such. One can check for this by reading one's writing aloud, omitting the content in brackets.

✗ DON'T: In [Dunmore, 1970], we see the first use of proof by nonexistent reference.

✓ DO: Dunmore [1970] was the first to call this technique "proof by nonexistent reference."

5.4.2 Numbers

See Dupré §24 and 34. Writers normally spell out whole numbers less than 10, but use numerals for units of measure, time, dates, page numbers, chapter numbers, percentages, money, proportions, part of a series of larger numbers. But strive for clarity: **✗ DON'T:** 20 100-Mbit Ethernet ports.

✓ DO: Twenty 100-Mbit Ethernet ports.

5.4.3 Decimal points

Use decimal points to express a level of precision in numeric values. Consider for example the difference between

"The rod was one-half inch in diameter"

and

"The rod was 0.50 inches in diameter".

The former expresses that the rod is "about" half an inch in diameter. The latter says that the rod is somewhere between 0.495 inches and 0.505 inches in diameter—it is more exact. Neither of these is wrong; which is better depends on how precise the figure needs to be.

5.4.4 Capitalization

5.4.5 Fonts

5.5 Punctuation

Good punctuation is essential to clear writing. Bad punctuation, on the other hand, is distracting at best and confusing at worst. Consider for example:

✗ **DON'T:** For dinner we had chicken and Robert and Nancy came over.

This could mean:

✗ **DON'T:** For dinner we had chicken and Robert, and Nancy came over.

Or it could mean:

✓ **DO:** For dinner we had chicken, and Robert and Nancy came over.

Here are some guidelines for good punctuation.

5.5.1 Quotations

Quotations should either be in quotes or in a different font. In the USA, a printers' convention holds that commas and periods that logically follow a quotation are moved inside the closing quotation mark. (British usage is to punctuate according to sense.) This is problematic when you are quoting computer input. A better alternative is to use a different font for computer input and output.

✗ **DON'T:** Type "rm *," then press "return"

✓ **DO:** Type `svn commit`, and press `RETURN`; you will be prompted for a commit message.

5.5.2 Colons and Semicolons

5.5.3 Commas

5.5.4 Solidus and Dashes

The solidus (/) means "per" or "divided by." Don't use it in text.

✗ **DON'T:** Input/output operations are time-consuming.

✗ **DON'T:** His/her productivity should be improved if he/she adopts the new tool.

See Dupré [1, §117].

You will probably use four different dashes: mathematical minus ($x - y$), the hyphen (used within a word), the en-dash [1, pp 218–221], and the em-dash — which I think looks best with a hairline space on either side. Know how to type each in your chosen tool!

5.5.5 Parenthesis

5.6 Further Reading

These examples are based on a set of PowerPoint slides called *105Mechanics*. Read over the sides and consider adding to this document. <http://www.cs.pdx.edu/~black/ScholarshipSkills/LectureNotes/105Mechanics.pdf>

Acknowledgments

Many of the examples in this chapter have been contributed by David Maier and Andrew Black. Others have been inspired by Lyn Dupré [1] and H.W. Fowler [2].

References

- [1] Lyn Dupré. *Bugs in Writing: A guide to debugging your prose*. Addison Wesley, 1998.
- [2] H.W. Fowler. *A Dictionary of Modern English Usage*. Oxford University Press, Oxford, New York, second edition, 1985. Revised by Sir Ernest Gowers.