Point of View

SCIENTIA AGRICOLA

Academic writing, and how to write in a clear and comprehensible way

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ABSTRACT: An intrinsic part of our lives as scientists, academic writing strongly affects our careers. Even great researchers are much more likely to be successful if they are also proficient writers. Unfortunately, many researchers prefer long hours spent in the field or laboratory to writing. Often, this is a result of their reluctance towards writing, something that characterizes not only scientists, but many people in general. But many researchers do not like writing because they do not know how to do it well—academic writing is not that simple. In this paper, I show how to improve your academic writing skills. I do not teach writing; instead, I share my experience about learning how to write.

Keywords: journals, editing, agricultural writing

Introduction

If you want your research to be well received, you need not only to deliver interesting research, but also to deliver it in an interesting way. To accomplish this, you should try to write your scientific texts in an easy to understand, yet stylish way. Is it simple? No, it's not. But it is achievable.

Of course, if you are a native English speaker, you're lucky. Most likely, this will come much easier to you than to non–native English speakers, but you should at least learn a little bit, too. Most native English speakers need to learn how to write effectively, since the art of writing does not come naturally, at least not to most of us.

If you are a non–native English speaker like me, the path ahead is much longer and more difficult. But you can still learn how to make your writing better, even good—even very good. This will seldom be an easy and quick process, though.

This paper aims not to teach you to write, but about how to learn how to write well. I am going to be subjective, since this topic is not bound by strict rules. Some say that academic texts must be formal and do not have to be interesting—only the research itself needs to be interesting. Others say, myself among them, that academic texts should be written in such a way that the reader will enjoy reading them, not only because of what they discuss, but also because of how they are written. This is also the subject of this paper. I am also going to show you particular examples from this journal that demonstrate that sometimes it takes just a simple measure to enrich your writing.

I will start off by explaining what I mean by well–written text. Then, I will suggest ways of learning how to write in English, a difficult and time–consuming process, especially when one does not know how to do it effectively. Next I will show you several examples, not to teach you but rather to show that sometimes (though not always) it is very easy to improve a sentence. Sometimes you can simply remove a sentence. Sometimes you can split one sentence into two, and that's all that is needed. Sometimes, however, you may need to revise the whole sentence in order to make it understandable.

What makes text well–written?

Well–written text is, in my opinion, writing that readers find attractive to read. This explanation does not make things simple, since readers of your scientific articles will prefer different styles. Some will expect formality, others a smoother flow of the writing. Some will expect the writing to contain pure research, others will look for pleasure in your interpretations and how you present them. In other words, they would like to enjoy what you wrote as much as the research you describe. It's much easier to read about a complex and difficult phenomenon when you do not have to focus on understanding every single word due to an unfriendly style and overly strict grammatical structure.

The very first thing you *must* ensure, however, is correctness. Grammar mistakes will make your text read poorly, no matter what.

But just using correct English is far from enough. Your text can be a simple, correct list of three–word sentences, and it does not matter if all of your words are correct—such text will be a nightmare for the reader.

This brings us to what really makes the difference: style.

Write your papers in a simple, straightforward style, while at the same time trying to avoid too much formality and passivity (Kozak and Hartley, 2019). It does not mean you should write in slang and never use the passive voice; it only means that you should find the balance between formality and informality, one that your readers (including the editor and reviewers) will accept and hopefully like.

Does this mean I want the English language of scientific texts to be simple? The answer is not straightforward. When I read about Francis Flaherty's great affection for words and letters (Flaherty, 2009), I wanted to scream, "Don't! Don't write in simple language!" and, using his words, "Write rich!" But then a moment of contemplation came. Well, yes, I think scientific writing calls for English that may be considered simple, and I am not alone in this preference. Throughout

her book, Anne E. Greene calls for writing science in plain English (Greene, 2013). Flaherty says, "To enrich our writing is one reason we turn to synonyms for a word that otherwise we would have to repeat frequently in a story." In other words: Repeating the same word is boring. I concur, yet Greene says, "Many scientific writers believe that repeating the same term for an important character makes their writing boring and repetitive. So instead they use different terms. By doing so they risk confusing their readers who think they mean different things. For a reader, consistent terms are the opposite of boring; they are essential to navigate new, complex information." I again concur.

Am I inconsistent? Yes and no. What I mean is, enrich your writing, but do not risk inconsistency. Do not overdo using different terms to describe the same thing or process or phenomenon; in academia, it is better to be repetitive for consistency, even at the cost of being slightly boring, than to be unclear. At the same time, remember that scientific texts constitute much more than just the few crucial terms they are built around. You can make this writing more attractive using stylistic tools other than using various terms to describe important elements of your research.

Nonetheless, I do not want to claim that scientific writing should be dull or overly simplistic. It can be plain and yet still beautifully written. Its charm can be in a simple and yet powerful way of conveying the intended message. In a recent paper I wrote together with James Hartley, we have pointed out that style is a far-too-often neglected virtue of scientific texts (Kozak and Hartley, 2019). So, scientists should pay more attention to polishing their writing, keeping their readers in mind. I am fairly sure most readers, when reading a difficult scientific text, will prefer finding pleasure in its message when conveyed in a stylish way, over suffering through text full of pompousness and complexity.

Don't get me the wrong way. I love writing. I love reading. I love words. And I do love seeing powerful changes in meaning; take a few words and turn them into a sentence. Then change their order, sometimes even only a little bit, and magic happens: The meaning has changed! But even something as small as a comma can have a huge effect on meaning. The following well-known sentence offers a fantastic example: "Eats shoots and leaves," which describes a panda's diet. However, if you simply add a comma, you get "Eats, shoots and leaves," meaning it eats first, then shoots (such as using a weapon), and then leaves! Not coincidentally, *Eats, Shoots & Leaves* is a title of Lynne Truss's book, from which I took the example (Truss, 2003).

Flaherty comes to the rescue: "But beware too much word-love. Do not get too juiced by the joy of words; love it but learn to curb it… Why? Because word-love can blind you to the overall structure of the story" (Flaherty, 2009).

Words and sentences carry a lot of magic. You can experiment even with simple words and sentences.

Believe me, so many of your readers would appreciate your attempts to write in plain yet beautiful language that it's worth giving it a try.

Forsyth (2013) writes, "I hope I dispelled the bleak and imbecilic idea that the aim of writing is to express yourself clearly in plain, simple English using as few words as possible. This is a fiction, a fib, a fallacy, a fantasy and a falsehood. To write for mere utility is as foolish as to dress for mere utility." Perhaps Forsyth is right about fiction, but science is different from fiction and even non-academic non-fiction writing. Science itself is complex, and writing about it in difficult language can make it incomprehensible, especially for non-native English speakers; that is, for most readers of scholarly literature.

Finally, we have to remember that when writing a methods section, we can use a slightly different style than when writing an introduction or discussion. We can be less formal when we're describing our thoughts — yes, we scientists think and our papers show our thoughts, even if we want to believe that science is objective. When we describe a procedure, the best choice can be clear, formal language.

As you have likely noticed, I am writing this text in quite informal language, at least for a scientific article. I do so on purpose. I would certainly use more formal language in a traditional scientific article, even though I try not to be as formal as most academic writers. For example, in many situations you can choose an active verb to make a sentence more lively. If you can do so, such a sentence may be easier to understand, and that is something that will make your readers happy.

How to learn to write?

Many say that the best way to learn how to write academic texts is by reading academic texts. This saying, however, lacks one word, a word that makes a whole world of difference, a word without which this sentence is *not* true. This word is: *well-written*. Because the best way to learn how to write academic texts is not by reading academic texts, but by reading *well-written* academic texts.

The problem is that the vast majority of scientific articles are not well written, with a large part even being poorly written. Someone who knows and writes English well can distinguish between well-written and poorly-written texts, but someone who is just learning to use this language will have a problem with it. If so, how can a person learn from scientific literature?

It is not a good idea, then, to learn writing only from academic texts if you cannot distinguish well-written from poorly-written text. Instead, I'd suggest learning from good books on writing. Many such books deal with general, non-academic writing. I provide a list of good resources in Kozak (2020). Here, I would like to list several such books, ones that I consider particularly well-written and offering particularly good advice: Williams (1997); Kane (2003) and Greene (2013).

As for good academic reading, you might find it in many *Science* and *Nature* non-research articles, mainly those written by the journal's staff. You can also find examples of fantastic academic writing in Richard Dawkins' *The Oxford Book of Modern Science Writing* (Dawkins, 2008).

One great way to learn how to write is to write with other good writers. But this does not mean being a static observer of what your co-author(s) are doing. Rather, it means *learning* from them. You should be the main author, and thus write as much as possible, then observe all the changes your co-author has made. I have been using this method for years, and it has many great effects. I have learned a lot from my co-authors, and my texts were improved thanks to these co-authors. This helped to get them published in respected journals.

This method comes with two difficulties. First, you need to find a good writer and convince him or her to work with you. Second, and maybe even more difficult, you must resist the temptation to let it go: If your co-author writes so well, why shouldn't you focus on your research? Tempting? Very, but also very risky. Remember? You wanted to *learn* from this person, not to let him or her work for you.

These are methods that work for me. Maybe you will find other methods that work for you. Experiment with them. For example, I do not attend English courses; I have always felt that it was just a waste of time, but maybe it would be more helpful for you. Maybe you could benefit from online courses or individual learning (there are people that teach writing online). Always remember that learning English and learning to write academic papers in English are two very different things, and the former will never be a good substitute for the latter. Simply put, if you want to learn how to write, learn how to write.

Whatever method you choose, you will never learn good writing without actually writing yourself. If you do not have anything to write about right now, I'd suggest writing a review about something that lies within your research topics. Not only will you spend time on learning writing, but also you will learn more about your research area. You can later try to publish what you wrote as a review paper — yet another advantage. Whether or not you succeed in publishing the paper, writing will *always* be time well spent!

Writing tools

There are many tools that can you help you write manuscripts. Dictionaries are certainly the most important among them, but as we have discussed, words are just one side of the mirror. The other one is style, something that is much more difficult to control using automatic tools.

This does not mean there are no tools to help with style. There are some very helpful ones listed below. The list below is by no means complete, but it does include several very useful tools.

Ludwig: http://ludwig.guru. Ludwig is a great resource for academic writing, one that deals with both words and sentence construction. It is a search engine that provides contextualized examples mainly from academic sources, but also other sources, like magazines. It offers not only a simple search, but also search within context, offering help in ordering sentences, paraphrasing them, choosing the most frequent words in the context, etc. (Figure 1).
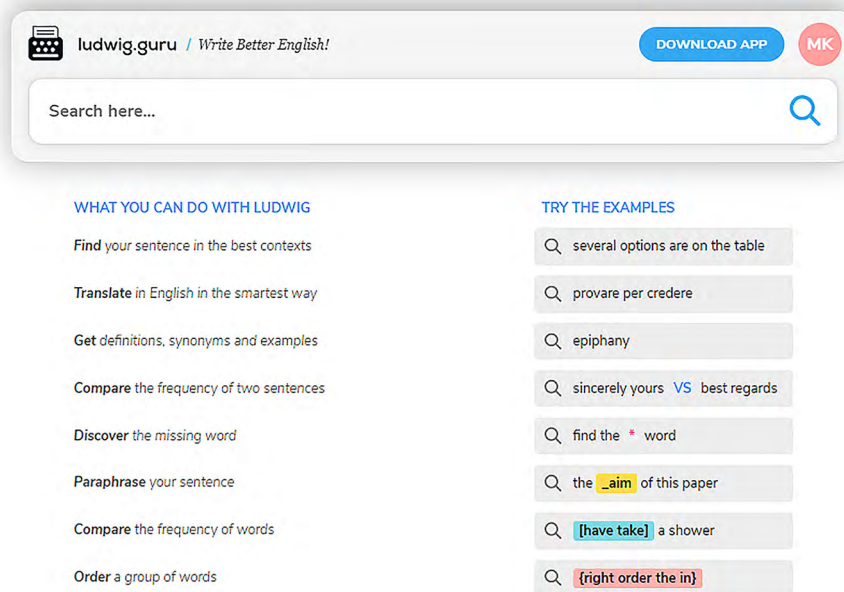
Figure 1 – A partial screenshot of Ludwig's web page (http://ludwig.guru), showing what one can do with this tool.

The Writer's Diet test: http://writersdiet.com/test.php. This tool is greatly described in Helen Sword's book, *The Writer's Diet* (Sword, 2015). It can help you catch overused "be" verbs; nominalizations (nouns that might be better represented as actions, so with verbs); prepositions; adjectives and adverbs; and "it," "this,", "that" and "there." Figure 2 shows example results of using the test.

ProWritingAid: http://prowritingaid.com. I use the paid version of this tool as an add–on to my MS Word (Figure 3). Several years ago, I used it for every single paragraph I wrote; now I use it occasionally. It takes time to use it, especially if you run a full analysis with all options. When I run it nowadays, I usually choose the grammar check, the writing style check, and the consistency check.

GradeProof (http://gradeproof.com), Grammarly (http://grammarly.com), and the like. These and other similar tools, all having the same aim as ProWritingAid, offer help with words, sentences, and style. In my opinion, they are worth using even if you are an advanced writer. They can help you catch various mistakes, and even the best writers make them from time to time. Use such tools wisely and with caution, however. Treat what they offer as suggestions. People who do not know English well should be particularly careful, since it is tempting to accept any suggestions they are offered.

Examples

In this section, I will show you how to improve several examples of real sentences and phrases. These examples do not aim to teach you anything specific, but rather to show you that sometimes it takes simple measures to improve writing.

Unfortunately, it is difficult to analyze phrases and constructions out of context. A sentence that makes perfect sense in one text does not necessarily work at all in another. But since we cannot analyze whole texts here, we will consider single sentences or passages consisting
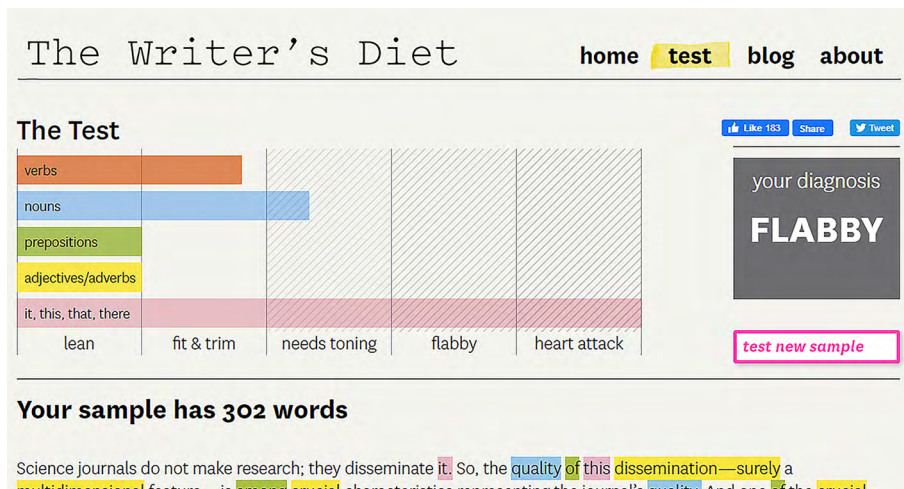
Figure 2 – A partial screenshot from the Writer's diet test (http://writersdiet.com/test.php). I ran it using the first draft of the conclusion section of this paper. As you can see, the test showed a heart attack. I did revise the passage, but the risk of heart attack did not decrease. After some pondering, I decided to agree to it, because I wanted to keep a very long sentence at the end of the article. I liked this sentence, but before deciding to keep it, I read it ten times to make sure it was right. The longer the sentence, the higher the risk that it is unclear; the more atypical the construction (here, due to the repetition of the word "that" for style), the higher the risk that the sentence will sound unnatural. This example shows that from time to time, you can risk breaking the rules. Frankly, great writers do it often. So do worse writers, and perhaps it is for this very reason that they have not joined the former group—they lack the skills to break the rules in ways that the resulting construction could be hung on a wall, instead of thrown in the trash
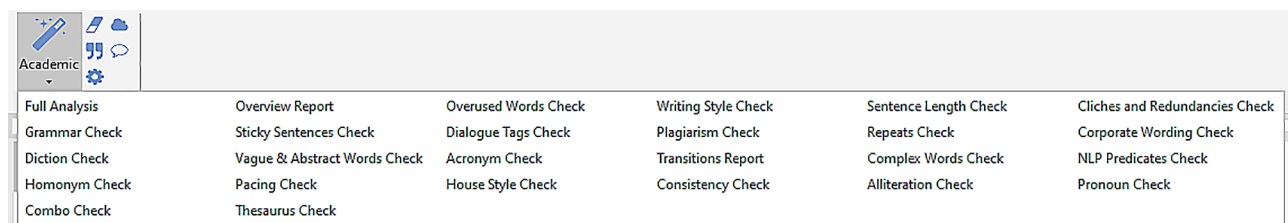
Figure 3 – The screenshot of the ProWritingAid add–on to MS Word, with a box listing all its functions.

of several sentences. Of course, we will not perform true sentence analysis; instead, we will just have a look at how we might improve these passages to make them clearer, and maybe nicer for the readers.

Example 1. Minor revision for a nice effect. Source: Maldaner et al. (2021)

Original

This study developed a methodology that allowed the behavior analysis of GNSS receivers of different accuracy levels under static and dynamic conditions.

Revised

This study developed a methodology to analyze how GNSS receivers of different accuracy levels behave under static and dynamic conditions.

Original

The adaptation of the Global Navigation Satellite Systems (GNSS) technology to fit the needs of farmers requires knowledge of the accuracy level delivered by a GNSS receiver in working conditions.

Revised

To adapt the Global Navigation Satellite Systems (GNSS) technology to farmers' needs, we should learn how accurately a GNSS receiver performs under working conditions.

Maldaner et al. (2021) article is actually quite nicely written, but I did find some sentences to improve anyway. To be honest, we are likely to find sentences to revise in every single article. I chose these two, since in both cases, the subtle changes we made led to sentences that became more direct and active. Note also that both are shorter than their original versions. Sometimes, a sentence with many nominalizations (like the second original one above) can be difficult to fully understand, because nominalizations and the passive voice often hide the players: *who did this* or *who is to do this*? In the second sentence, we indeed do not see who the author is talking about. Clearly, it is a general sentence, but who is to adapt the GNSS system to farmers' needs? Scientists? I used this meaning in the revision.

Example 2. Split a sentence. Source: Sousa et al. (2021)

Original

The findings provide useful information about *H. armigera* population densities and indices of male moths recorded per trap help make control decisions for processing tomato.

Revised

The findings shed light on *H. armigera* population densities. Indices of male moths recorded per trap help make control decisions for processing tomatoes.

Revised, simplified version

The findings shed light on *H. armigera* population densities. Per-trap indices of male moths help make control decisions for processing tomatoes.

The original sentence presents two unrelated (or rather not *too closely* related) pieces of information in such a way that the readers, during reading, will try to join them. Only when they get to the verb "help," will they notice that they misunderstood the sentence's meaning. The revised version splits the sentence into two, thereby separating the two pieces of information. Now the reader should not have problems with immediate processing of the passage and the two pieces of information.

Example 3. Coelho et al. (2021).

Original

If an article met the inclusion criteria then it was included for participation in this study; if an article met the exclusion criteria then it was not included.

Revised

I would simply remove this sentence. We can assume that the authors listed these inclusion criteria before this sentence—and they did indeed. Inclusion criteria mean that if something ("an article" in the sentence) meets them, then it is included; otherwise it is not. Do we need to say this? This whole sentence, then, was superfluous.

Example 4. Replace wordiness with simplicity. Source: Kozak (2009).

Original

Then, the question that suggests itself is whether there is any superiority of analysis of variance in comparing two treatment means from among a number of means over classical t–test to compare two means.

Revised

Then, the question that suggests itself is, why should we use analysis of variance to compare two treatment means from among a number of means, instead of using the classical t–test to compare two means?

Revised, simplified version

But why should we apply analysis of variance instead of the classical t–test to compare two means out of a number of means?

I used this example mainly to show you that I am not happy with many sentences I wrote. It's natural, and after some time, you will dislike many sentences you wrote in the past.

Here, the original text was clumsy and wordy. Many constructions we use in academic texts constitute

nothing more than mere background noise; something that does not have any particular objective, maybe just to "be there and look nice." Half of the original sentence above is such background noise. Now I would definitely choose the second revision, which is direct, to the point, and much stronger. You might dislike that I started the revised sentence with "but"; some say that you should never do so. But why not? It is a strong word, in this sentence much stronger than "however" would be.

Example 5. Write active prose! Source: Croge et al. (2021)

Original

To emphasize the importance of this species as potential source of agro–economic resources and highlight its versatile chemical composition and the possibility of multiple uses, we conducted a literature review on its botanical, ecological, agronomic, and industrial aspects. In addition, we present information on its biochemical composition and biological activity.

And that's it. No revision. I am not saying this sentence is perfect (we could add an indefinite article "a" before "potential source"), but I like it. It also shows something about *Scientia Agricola*: It is not afraid of publishing papers with active sentences, whose authors say what *they* think and what *they* do. I like the first–person plural "we," a very strong word in academic writing. Do not be afraid to use it!

But as is the case with any other word, don't overuse it. Sentence after sentence starting off with the very same construction (here, starting off with "we...") can quickly become boring, signaling bad style.

Conclusion

It matters how you write. For many of you this does not come as a surprise, but there are researchers who do not pay attention to how they write. Good journals receive many submissions, and some of them are really well–written. Many, however, are poorly written and thus rejected outright, without even being sent to review. Why would you risk something like that by not paying enough attention to the quality of your texts? Experiments in agricultural sciences often take years; why should you consider an additional week spent on writing a waste of time?

Learning takes time, effort and patience. I do not aim here to teach anyone how to write well, but I hope to have convinced you that the time spent on learning how to write is time well spent. I am sure everyone will improve with time, if only they keep learning. It will take years (the rest of your life, to be frank), but as time passes, you will see that your writing will keep getting better and better; that you spend less time on writing than you used to; that reviewers' and editors' comments about your writing are less harsh; that, perhaps, you start *enjoying* the process of writing about your research. Maybe one day someone will tell you, "I envy you. You write so well!" Hearing this may give you additional motivation to learn even more, because you will already know that writing is an important part of your science, career and development.

Acknowledgments

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