Technical Communication

Session 2

Communicating Scientific ideas clearly: From Clutter to Clarity

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Characteristics of good scientific writing

Scientific writing is about communicating ideas.

Characteristics of good scientific writing
Good scientific writing is:

- **clear -** it avoids unnecessary detail

- **simple -** it uses direct language, avoiding vague or complicated sentences. Technical terms and jargon are used only when they are necessary for accuracy

- **impartial -** it avoids making assumptions (Everyone knows that ...) and unproven statements (It can never be proved that ...). It presents how and where data were collected and supports its conclusions with evidence;

Characteristics of good scientific writing

- **structured logically** - ideas and processes are expressed in a logical order. The text is divided into sections with clear headings

- **accurate** - it avoids vague and ambiguous language such as about, approximately, almost

- **objective** - statements and ideas are supported by appropriate evidence that demonstrates how conclusions have been drawn as well as acknowledging the work of others.

Choosing the words

To make your writing clear, accurate and concise you should consider carefully the words that you use, and the ways in which you use them.

Technical terms

In most scientific writing you will need to use some scientific or technical terms in order to be clear and unambiguous. However, use such terms only when you need to do so and do not try to impress the reader by using unnecessary technical jargon or lengthy words.

Abbreviations

Abbreviations can be a very useful way of saving time and avoiding repetition, but they can be confusing and might not be understood by everyone. Use standard abbreviations where these exist, and reduce your use of abbreviations to an absolute minimum; they are rarely essential.

Choosing the words

Use objective rather than subjective language

Objective language is language that is impartial and states a fact or process; subjective language is open to question or interpretation as it implies personal thought or belief.

For example:

objective*The car travelled at 38 kilometres per hour*
is a clear, objective statement of fact.

However:

subjective *The contents of the test tube turned a beautiful blue colour*
uses *beautiful* in a way that is subjective because it cannot be measured or accurately explained to the reader. Always use language that is concrete and specific rather than vague and personal.

Choosing a 'voice'

Scientific writers have a tendency to use *passive* rather than *active* expressions;

stating that *a* was affected by *b* uses the passive voice while stating that *b* did something to *a* uses the active voice.

The following example shows a sentence written in both the passive and active voices.

passive *The experiment was designed by the research officer*
active *The research officer designed the experiment*
The passive voice is particularly useful when:

- you wish your writing to be formal and depersonalised:

passive *It was agreed that the experiment should be...*
active*We agreed that the experiment should be...*

- information about the agent is obvious or unimportant

Choosing a 'voice'

passive *Extra solvent was added to the flask*
active *The technician added extra solvent to the flask;*

- you do not know the identity of the agent:

passive The water pipe was broken in three places
active Something/someone had broken the water pipe in three places
However, the use of the passive voice can lead to clumsy and overcomplicated sentences.

passive Difficulty was experienced in obtaining the product in a high state of purity
is rather convoluted way of saying
active The product was difficult to purify
which is a much clearer and more straightforward statement.

In general, the active voice is clearer, more direct and easier to read, but the passive voice can be more appropriate in particular circumstances.
What is most important is for you to be aware of how you are writing, and how the voice that you choose affects the tone and the meaning of your words.

Weak intensifiers

Avoid using “very, interestingly, strikingly, new, novel, excitingly...”

Only the content itself can be interesting, striking, or novel.

Editorialising

—proclaiming your opinion that something is interesting or whatever only invites skepticism.

Annoying intensifiers can also have an emotional coloration, as in

“I deeply believe in the importance of cancer research”.

Imposing your emotions on others in a professional context is manipulative

Personal or impersonal?

Scientific writers often try to avoid the use of personal expressions or statements in order to make their writing seem more impartial and formal. The following sentence has been written with both personal and impersonal expressions to highlight the contrast between the two writing styles.

impersonal - The explanation for this phenomenon may be found in...
personal - We/I believe that the explanation for this phenomenon may be found in…

For example:

impersonal & passive
It was decided that the temperature should be raised gives no information about the identity of the people who made the decision.

Personal or impersonal?

However, used indiscriminately, writing impersonally can result in clumsy statements through an excessive use of the passive voice. This can lead to ambiguity or inaccuracy in your written work.

personal & active

We decided that the temperature should be raised avoids ambiguity and makes the sentence sound more direct, but uses the personal and rather informal ‘we’.

impersonal & active

The research team decided that the temperature should be raised is clear and direct.

Think carefully about your use of impersonal and personal expressions, taking care to ensure that your writing is always clear and unambiguous.

Gender biased sentences

As an example, here is a gender-biased sentence:

“Every student should decide what he thinks is best for his own education in biology”.

One approach is to use the gender-neutral third person plural:

“Every student should decide what they think is best for their own education in biology”.

In some cases switching to the second person can also side-step sexist usage:

“Each student should decide what you think is best for your own education in biology”.

Sentence length

Sentences that are too short and poorly connected can be irritating to read.

Conversely, sentences that are too long and rambling are difficult to follow and are likely to be confusing.

Use a sentence length that allows your thoughts to flow clearly. As a general rule there should be no more than 20-25 words in any one sentence.

You may be able to reduce your sentence length by:

- cutting out unnecessary words

like might replace *along the lines of*
now may be just as appropriate as *at the present time*

Sentence length

W*e can now turn our attention to* could perhaps be cut out entirely;

- dividing complex sentences into separate phrases or sentences.

If a breakdown occurs it is important that alternative supplies are available and the way that this is done is for the power stations to be linked through the high voltage transmission lines so that all of them contribute to the total supply of energy and an unexpectedly large demand can be handled.

It can be re-written thus:

If a breakdown occurs it is important that alternative supplies are available; this is done by linking power stations through the high voltage transmission lines. All of them thus contribute to the total supply of energy and an unexpectedly large demand can be handled.

Clauses…

Please do not start sentences with long modifying clauses.

Here is an example:

“Using phosphorescence imaging as a form of biological oximetry, we confirm the oxygen poor environment of the gut lumen and demonstrate the existence of a dynamic equilibrium with an established gradient whereby the mammalian gut releases oxygen into the gut lumen”.

A reader will likely need to read the sentence several times to get the meaning.

The much shorter revision below, which lacks the modifying clause, captures most of the content:

“We used phosphorescence imaging to characterise oxygen gradients in the gut lumen and found higher levels near the gut wall”.

How to deal with a sentence?

Here is a sentence from a paper on the growth of carbon nanotubes.

“These results suggest that it would be fundamentally difficult to achieve a fast growth with a long lifetime.”

Here is the sentence without “fundamentally”?

“These results suggest that it would be difficult to achieve a fast growth with a long lifetime.”

There is no difference in meaning between “difficult” and “fundamentally difficult”.

The two sentences differ in that the first contains a useless word of five syllables.

How to deal with a sentence?

The sentence also has other problems

—the authors should have written “fast growth rate” instead of “a fast growth”,

or still better something more specific.

Always delete “fundamentally” from your writing.

Similarly, delete “certainly” and “basically”.

“Basic” is fine when it means high pH, but not when interchangeable with “fundamentally”.

Scrutinize your prose for additional words that add nothing and can be deleted.

Rephrase for brevity

Editing is hard work. Below are three before-and-after examples.

The first is a wordy paragraph

1) Original: “Much interest has centered on the question of whether host proteins are important for the function of PICs in vivo. This article will first review proposals for important proteins arising from studies of PICs, then review studies employing reactions with purified integrase. Proteins thought to influence integration by binding target DNA will be considered in a following section”. (58 words)

Here is a version rephrased for brevity that is also more accurate.

“Are host proteins important for the function of PICs? Below I review proposals derived from in vitro studies of PICs, purified integrase, and purified target DNA binding proteins”. (28 words)

Rephrase for brevity

2) Original: “A wide variety of factors influence the success of treatment of multiple human cancers.” (14 words)
Rephrased: “The success of cancer therapy is affected by multiple factors.” (10 words)

3) Original: “Based on data presented here and the published literature (21-23), we propose a model in which HIV can exploit binding to multiple cell surface proteins to enter cells efficiently.” (29 words).
Rephrased: “Evidently HIV can bind multiple cell surface proteins to facilitate entry (this work and 21-23)”. (15 words).

Rephrase for brevity

"A robust cell-mediated immune response is necessary, and deficiency in this response predisposes and individual towards active TB."

Notice how the two parts of this sentence actually say the same thing. One part says it's necessary, the other part says Is that bad things will happen if you don't have it. So we can convey the same idea here by just saying,

"Deficiency in T-cell-mediated immune response predisposes an individual to active TB."

- It is of considerable importance to ensure that under no circumstances should anyone fail to deactivate the overhead luminescent function at its local activation point on their departure to their place of residence, most notably immediately preceding the two day period at the termination of the standard working week.

- Always turn the lights out when you go home, especially on a Friday.

- The clearest available example of such Western epistemic violence is the remotely orchestrated, far-flung, and heterogeneous project to constitute the colonial subject as Other.

- Western discourses have intentionally made the colonial subject as other.

So,

- Complex ideas might not require complex language
- Scientific writing can also be easy and enjoyable to read

- “These findings imply that the rates of ascorbate radical production and its recycling via dehydroascorbate reductase to replenish the ascorbate pool are equivalent at the lower irradiance, but not equivalent at higher irradiance with the rate of ascorbate radical production exceeding its recycling back to ascorbate”

- These findings imply that, at low irradiation, ascorbate radicals are produced and recycled at the same rate, but at high irradiation, they are produced faster than they can be recycled back to ascorbate.

- This paper provides a review of the basic tenets of cancer biology study design, using as examples studies that illustrate the methodologic challenges or that demonstrate successful solutions to the difficulties inherent in biological research.

- This paper reviews cancer biology study design, using examples that illustrate specific challenges and solutions.

- As it is well known, increased athletic activity has been related to a profile of lower cardiovascular risk, lower blood pressure levels, and improved muscular and cardio-respiratory performance.

- Increased athletic activity is associated with lower cardiovascular risk, lower blood pressure, and improved fitness.

- The experimental demonstration is the first of its kind and is a proof of principle for the concept of laser driven particle acceleration in a structure loaded vacuum.

- The experiment provides the first proof of principle of laser-driven particle acceleration in a structure-loaded vacuum.

- Brain injury incidence shows two peak periods in almost all reports: rates are the highest in young people and the elderly

- Brain injury incidence peaks in the young and the elderly

Basic Principles of effective technical writing

- Content and Context
- Who is your audience?
- Style guide
- Writing Style
- Accessing information
- Grammer
- Be careful not to plagiarise

Basic Characteristics of technical writing

- Keep it to the point
- Clarity and conciseness
- Choose exactly what you need to say
- How can you best express them
- Create a scheme

Avoid Clutter