Writing in the Sciences

Unit 1: Introduction; principles of effective writing

Writing in the Sciences

Module 1.1: Introduction

1.1 Introduction

- What makes good writing?
  - **1. Good writing communicates an idea clearly and effectively.**
  - 2. **Good writing is elegant and stylish.**

Takes having something to say and clear thinking.

Takes time, revision, and a good editor!

1.1 Introduction

- What makes a good writer?
  - Inborn talent?
  - Years of English and humanities classes?
  - An artistic nature?
  - The influence of alcohol and drugs?
  - Divine inspiration?

1.1 Introduction

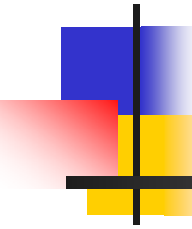
What makes a good writer:

- Having something to say.
- Logical thinking.
- A few simple, learnable rules of style (the tools you'll learn in this class).

Take-home message: Good writing can be learned!

Steps to becoming a better writer:

- In addition to taking this class, other things you can do to become a better writer:
  - Read, pay attention, and imitate.
  - Write in a journal.
  - Let go of “academic” writing habits (deprogramming step!)
  - Talk about your research before trying to write about it.
  - Write to engage your readers—try not to bore them!
  - Stop waiting for “inspiration.”
  - Accept that writing is hard for everyone.
  - Revise. Nobody gets it perfect on the first try.
  - Learn how to cut ruthlessly. Never become too attached to your words.
  - Find a good editor!
  - Take risks.



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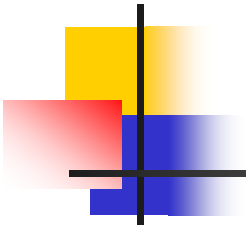
Module 1.2: Examples of what not to do



Disclaimer

- I omit exact citations from many of my examples to protect the innocent and the guilty.

Help!

- This was the first sentence of an article in the *Journal of Clinical Oncology* (Introduction section):
- “Adoptive cell transfer (ACT) immunotherapy is based on the ex vivo selection of tumor-reactive lymphocytes, and their activation and numerical expression before reinfusion to the autologous tumor-bearing host.”

- Ask Yourself:
  - Is this sentence easy to understand?
  - Is this sentence enjoyable and interesting to read?

Another amusing example

- “These findings imply that the rates of ascorbate radical production and its recycling via dehydroascorbate reductatse 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.” (from *Photochemistry and Photobiology…*)

- Is this sentence readable?
- Is it written to inform or to obscure?

A classic hallmark of "academic writing": spunky verbs become clunky nouns...

- "Adoptive cell transfer (ACT) immunotherapy is based on the ex vivo **selection** of tumor-reactive lymphocytes, and their **activation** and numerical **expression** before **reinfusion** to the autologous tumor-bearing host."

- "These findings imply that the rates of ascorbate radical **production** and its **recycling** via dehydroascorbate reductatse 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."

After much **work** on my part, I translated this too...

- “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.”

Themes of this course:

-Complex ideas don’t require complex language.

-Scientific writing should be easy and even enjoyable to read!

"My professor friend told me that in his academic world, 'publish or perish' is really true. He doesn't care if nobody reads it or understands it as long as it's published."

There's a hint of truth here, *n'est-ce pas*?

From: Anne Ku. "The joys and pains of writing and editing," *Le Bon Journal, 2003*
http://www.bonjournal.com/volume2/issue1writing.pdf

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Module 1.3: Overview: principles of effective writing

One more example!

Dysregulation of physiologic microRNA (miR) activity has been shown to play an important role in tumor initiation and progression, including gliomagenesis. Therefore, molecular species that can regulate miR activity on their target RNAs without affecting the expression of relevant mature miRs may play equally relevant roles in cancer.

From an article in *Cell*

Example

Note the use of nouns instead of verbs.

Dysregulation of physiologic microRNA (miR) activity has been shown to play an important role in tumor initiation and progression, including gliomagenesis. Therefore, molecular species that can regulate miR activity on their target RNAs without affecting the expression of relevant mature miRs may play equally relevant roles in cancer.

Example

Note the use of vague words.

Dysregulation of physiologic microRNA (miR) activity has been shown to play an important role in tumor initiation and progression, including gliomagenesis. Therefore, molecular species that can regulate miR activity on their target RNAs without affecting the expression of relevant mature miRs may play equally relevant roles in cancer.

Example

Note the use of unnecessary jargon and acronyms.

Dysregulation of physiologic microRNA (miR) activity has been shown to play an important role in tumor initiation and progression, including gliomagenesis. Therefore, molecular species that can regulate miR activity on their target RNAs without affecting the expression of relevant mature miRs may play equally relevant roles in cancer.

Example

Note the passive voice.

Dysregulation of physiologic microRNA (miR) activity has been shown to play an important role in tumor initiation and progression, including gliomagenesis. Therefore, molecular species that can regulate miR activity on their target RNAs without affecting the expression of relevant mature miRs may play equally relevant roles in cancer.

Example

Note the distance between the subject and the main verb of this sentence.

Dysregulation of physiologic microRNA (miR) activity has been shown to play an important role in tumor initiation and progression, including gliomagenesis. Therefore, molecular species that can regulate miR activity on their target RNAs without affecting the expression of relevant mature miRs may play equally relevant roles in cancer.

Possible rewrite...

- Changes in microRNA expression play a role in cancer, including glioma. Therefore, events that disrupt microRNAs from binding to their target RNAs may also promote cancer.

Overview: Principles of effective writing

- 1. Cut unnecessary words and phrases; learn to part with your words!
- 2. Use the active voice (subject + verb + object)
- 3. Write with verbs: use strong verbs, avoid turning verbs into nouns, and don’t bury the main verb!

Writing in the Sciences

Module 1.4: Cut the clutter

Principles of Effective Writing

- "The secret of good writing is to strip every sentence to its cleanest components. Every word that serves no function, every long word that could be a short word, every adverb that carries the same meaning that's already in the verb, every passive construction that leaves the reader unsure of who is doing what—these are the thousand and one adulterants that weaken the strength of a sentence. And they usually occur in proportion to the education and rank."
- -- William Zinsser in *On Writing Well*, 1976

Example 1

"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.

Example 2

"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.

Increased athletic activity lowers cardiovascular risk and blood pressure, and improves fitness. (stronger level of evidence)

Example 3

- “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.

Thanks to Debra Biasca of the University of Colorado, Boulder for sharing some writing samples with me.

Cut unnecessary words

- Be vigilant and ruthless

- After investing much effort to put words on a page, we often find it hard to part with them.

But fight their seductive pull…

- Try the sentence without the extra words and see how it's better—conveys the same idea with more power

Cutting extra words

Example:

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

More punch→

"Brain injury incidence peaks in the young and the elderly."

Common clutter:

- 1. Dead weight words and phrases
  - As it is well known
  - As it has been shown
  - It can be regarded that
  - It should be emphasized that
- 2. Empty words and phrases
  - basic tenets of
  - methodologic
  - important
- 3. Long words or phrases that could be short
  - muscular and cardiorespiratory performance

"Some words and phrases are blobs."
-- William Zinsser in *On Writing Well*, 1976

Common clutter, continued:

- 4. Unnecessary jargon and acronyms
  - muscular and cardiorespiratory performance
  - Gliomagenesis
  - miR
- 5. Repetitive words or phrases
  - studies/examples
  - illustrate/demonstrate
  - challenges/difficulties
  - successful solutions
- 6. Adverbs
  - very, really, quite, basically, generally, etc.

Long words and phrases that could be short...

Wordy version	Crisp version
A majority of	most
A number of	many
Are of the same opinion	agree
Less frequently occurring	rare
All three of the	the three
Give rise to	cause
Due to the fact that	because
Have an effect on	affect

Long words or phrases that could be short...

- The expected prevalence of mental retardation, based on the assumption that intelligence is normally distributed, is about 2.5%.
- → The expected prevalence of mental retardation, if intelligence is normally distributed, is 2.5%.

Repetitive words or clauses

- A robust cell-mediated immune response is necessary, and deficiency in this response predisposes an individual towards active TB.
- → Deficiency in T-cell-mediated immune response predisposes an individual to active TB.

Blaise Pascal on the elegance in brevity:

"I have only made this letter rather long because I have not had time to make it shorter." ("*Je n'ai fait celle-ci plus longue que parceque je n'ai pas eu le loisir de la faire plus courte*.")

--Lettres provinciales, 16, Dec.14,1656

(though reference also attributed to St. Augustine, and Cicero....)

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Module 1.5: Cut the clutter, more tricks

A few other small tricks...

- Eliminate negatives
- Eliminate superfluous uses of “there are/there is”
- Omit needless prepositions

Eliminate negatives

- **She was not often right.**
  - **She was usually wrong.**
- **She did not want to perform the experiment incorrectly.**
  - **She wanted to perform the experiment correctly.**
- **They did not believe the drug was harmful.**
  - **They believed the drug was safe.**

Eliminate negatives

Not honest	dishonest
Not harmful	safe
Not important	unimportant
Does not have	lacks
Did not remember	forgot
Did not pay attention to	ignored
Did not succeed	failed

Eliminate there are/there is

There are many ways in which we can arrange the pulleys.

→We can arrange the pulleys in many ways.

There was a long line of bacteria on the plate.

→Bacteria lined the plate.

Eliminate there are/there is

There are many physicists who like to write.

→Many physicists like to write.

The data confirm that there is an association between vegetables and cancer.

→The data confirm an association between vegetables and cancer.

Omit needless prepositions

For example, “that” and “on” are often superfluous:

- *The meeting happened on Monday.*
- *The meeting happened Monday.*

- *They agreed that it was true.*
- *They agreed it was true.*

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Module 1.6: Practice cutting clutter

Practice: cut the clutter!

In a moment, I will ask you to pause the video and edit the following sentence:

Anti-inflammatory drugs may be protective for the occurrence of Alzheimer's Disease.

Possible rewrite

Anti-inflammatory drugs may protect against Alzheimer's Disease.

Practice

In a moment, I will ask you to pause the video and edit the following sentence:

Clinical seizures have been estimated to occur in 0.5% to 2.3% of the neonatal population.

Possible rewrite

Clinical seizures occur in 0.5% to 2.3% of newborns.

Practice

In a moment, I will ask you to pause the video and edit the following sentence:

Ultimately p53 guards not only against malignant transformation but also plays a role in developmental processes as diverse as aging, differentiation, and fertility.

Possible rewrite

Besides preventing cancer, p53 also plays roles in aging, differentiation, and fertility.

Practice

In a moment, I will ask you to pause the video and edit the following sentence:

Injuries to the brain and spinal cord have long been known to be among the most devastating and expensive of all injuries to treat medically.

Possible rewrite

Injuries to the brain and spinal cord are among the most devastating and expensive.

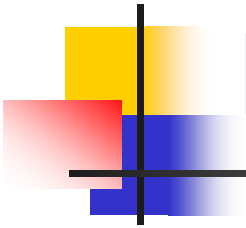
Practice

In a moment, I will ask you to pause the video and edit the following sentence:

An IQ test measures an individual's abilities to perform functions that usually fall in the domains of verbal communication, reasoning, and performance on tasks that represent motor and spatial capabilities.

Possible rewrite

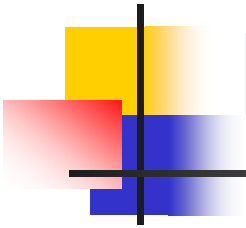
An IQ test measures an individual's verbal, reasoning, or motor and spatial abilities.



Practice

In a moment, I will ask you to pause the video and edit the following sentence:

As we can see from Figure 2, if the return kinetic energy is less than 3.2 U_p, there will be two electron trajectories associated with this kinetic energy.



Possible rewrite

Figure 2 shows that a return kinetic energy less than 3.2 U_p yields two electron trajectories.