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AND ARTS

Basic Writing Guidelines

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Writing Guidelines and Examples are taken from

- Skern, T. (2009). Writing Scientific English: A Workbook. Facultas, Vienna, Austria.
- Kelley, N. (2006). Sentence Structure of Technical Writing. Program in Writing and Humanistic Studies. Massachusetts Institute of Technology.
- Kirby, J. (2019). A Personal View of Scientific Writing or The Mistakes I Have Made! Newcastle University, UK.
- Cobb, K. (2019). Principles of Effective Writing. Stanford University, USA.

Overview

- ▶ Introduction
- ▶ Guidelines for Writing Good English
- ▶ Techniques for Improving Scientific Writing Skills
- ▶ Next Steps

Overview

▶ **Introduction**

- ▶ Guidelines for Writing Good English
- ▶ Techniques for Improving Scientific Writing Skills
- ▶ Next Steps

Introduction



- English is the language of science
- using English brings advantages as well as disadvantages

Introduction



Advantages of English

- grammar relatively straightforward
 - nouns have only one gender
 - adjectives have only one ending
- rich vocabulary
 - English has its roots in French, German and Scandinavian languages
 - therefore, often a French- and a German-based word for the same thing or concept
 - e.g., infancy / childhood, malady / sickness, transmit / send

Introduction



Disadvantages of English

- irregular pronunciation
 - in particular difficult for non-native speakers
 - e.g., “mature” and “nature”
- inconsistent spelling
 - problem as incorrect words can sometimes not be detected by a spell-checker

Introduction



Exercise: Spelling (Skern, 2009)

1. You must proof that two plus two equals four!
2. A prove that two plus two equals four is given on the first page.
3. Vaccines safe lives.
4. Spellcheckers chance the way we read our texts.
5. The theory of global warming remains to be proven.
6. Spellcheckers effect our ability to spell.
7. How do tortoises remain a life when hibernating?
8. Only a few scientists have received two Nobel Prices.
9. The affect of technology on the environment is substantial.
10. Tumour cells loose the normal controls of growth.
11. We judge how we live our lives form our own perspective.

Introduction



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Guidelines for Writing Good English



Overview

- Complete sentences
- Punctuation marks
- Write out all verb forms
- Avoid starting sentences with “and”, “but”, “because” or “so”
- Avoid ending sentences with “too”, “also”, “though” or “yet”
- Avoid “get”
- Avoid vagueness, sensationalism and exaggeration
- Using “the” and “a”

Guidelines for Writing Good English



Complete Sentences

- What is a complete sentence?

A complete sentence relates a finished thought or action.

- always write complete sentences
- only two exceptions
 - title of the paper
 - titles of figures and tables

Guidelines for Writing Good English



Punctuation Marks

- punctuation marks are essential information signs for readers and include
 - full stops (.)
 - commas (,)
 - semi-colons (;)
 - colons (:)
 - question marks (?)
 - exclamation marks (!)
 - quotation marks (" ")
 - brackets ()

Guidelines for Writing Good English



Punctuation Marks: Commas (1)

- use a comma when making a list
 - example: “u, v, x, y and z”
 - British English: **no** comma before “and”
 - American English: comma before “and”
 - **no** comma before “as well”
 - “p, q, r as well as t”

Guidelines for Writing Good English



Punctuation Marks: Commas (2)

- use commas to show material that is not central to a sentence
 - example: *"Our latest results, obtained using a recently developed technique, also support our overall hypothesis."*
 - text between commas provides extra information which is not essential to understand the meaning of the sentence

Guidelines for Writing Good English



Punctuation Marks: Commas (3)

- use a comma after a linking word
 - typical linking words include, e. g.
 - however
 - furthermore
 - additionally
- comma indicates where to look for the main part of the sentence
- example: *“As expected, levels of bacterial growth increased during the course of the illness.”*

Guidelines for Writing Good English



Punctuation Marks: Commas (4)

- do **not** use a comma before “that”
 - example: *“We showed that this hypothesis is false.”*

Guidelines for Writing Good English



Punctuation Marks: Colons (1)

- use a colon to introduce a list
 - example: *"We measured the following physiological parameters of competitive skiers: pulse rate, blood pressure, oxygen consumption and lactate concentration."*

Guidelines for Writing Good English



Punctuation Marks: Colons (2)

- use a colon to divide paper titles into two halves
 - first half: introduces the global subject area
 - second half: states the part of this area under investigation
 - examples:
 - *“Global Warming: The Contribution of Deforestation”*
 - *“Biodiversity: The Impact of Abolishing Lawn Mowing”*

Guidelines for Writing Good English



Punctuation Marks: Exclamation Marks

- avoid using them in scientific writing

Guidelines for Writing Good English



Punctuation Marks: Quotation Marks

- have to be used when directly citing other work
- but: direct quotes are rare
- scientists prefer to describe related work in their own words and give a reference to the original paper
- examples
 - *“Smith and Jones (Smith and Jones, 2018) reported that A is converted into B.”*
 - *“Li and Yu provided evidence that X can be generated from Y (Li and Yu, 2021).”*

Guidelines for Writing Good English



Punctuation Marks: Brackets

- used to mark text that is not essential to understanding the meaning of a sentence
- example:
 - poor style: *“Anti-viral agents are available to combat several viruses e. g. HIV, influenza virus and herpes virus.”*
 - better: *“Anti-viral agents are available to combat several viruses (e. g. HIV, influenza virus and herpes virus).”*

Guidelines for Writing Good English



Write Out All Verb Forms

- do not use shortened forms of verbs in formal English
- example: do not use “it’s”, “isn’t”, “can’t” or “don’t”

Guidelines for Writing Good English



Avoid Starting Sentences with “and”, “but”, “because” or “so”

- starting sentences with these words is considered to be poor style and not formal English
- instead use linking words to link sentences together

Guidelines for Writing Good English



Overview of Linking Words Commonly Used in Scientific Writing

Intention	Use Instead of	Examples for Linking Words
add further information	and	in addition, additionally, further, furthermore, indeed, moreover
introduce contrasting or contradictory information	but	however, in contrast, instead, nevertheless, occasionally, of course, on the contrary, otherwise
introduce information that follows	so	accordingly, as a result, consequently, hence, in short, subsequently, therefore, thus, to this end
give examples		for example, for instance
finish up		in summary, in short, in conclusion, taken together

Guidelines for Writing Good English



Avoid Ending Sentences with “too”, “also”, “though” or “yet”

- using such words at the end of sentences is again considered to be poor style and not formal English

Guidelines for Writing Good English



Avoid “get” (1)

- formal English does not contain the word “get”
- two reasons
 - “get” is considered poor style in a scientific manuscript
 - clarity will be improved by replacing it with more suitable words
 - e.g., “have”, “receive”, “obtain”, “possess” or “become”

Guidelines for Writing Good English



Avoid “get” (1)

- Example

- do not write :

“My supervisor got excited when I got some results using samples I got from Africa. However, she got angry when she got to know that I had got hold of them illegally.”

- instead write:

“My supervisor became excited when I obtained some results using samples from Africa. However, she grew angry when she found out that I had acquired them illegally.”

Guidelines for Writing Good English



Avoid Vagueness, Sensationalism and Exaggeration

- scientific writing should be accurate, appropriate and measured, therefore, avoid
 - words such as “a lot”, “a bit” and “a little”
 - instead of „a lot“ use, e.g., “several”, “many”, “certain”, “numerous” or “considerable”
 - adjectives such as “amazing”, “incredible”, “unbelievable”, “stunning” or “spectacular”
 - absolute statements (e.g., *“This hypothesis will never be falsified.”*)
 - exaggerated accuracy (e.g., *“Our results provide 100% proof of our theory.”*)

Guidelines for Writing Good English



Using “the” and “a”

- important to use „a“ and „the“ correctly in scientific English
- often a special problem for those whose first language lacks such words
 - includes Chinese, Japanese, the Slav languages and most African languages

Guidelines for Writing Good English



Using “the” and “a”

Guideline	Examples
use “a” to refer to a thing that is common (exceptions: use “an” if the word begins with a vowel, do not use “a” or “an” before words in the plural)	„There is a big mess on my desk.“ „We did an experiment to verify this.“ „There are many messes on many desks in the universe.“ „Many experiments are done every day.“
use “the” if referring to a specific thing	„The big mess on my desk is growing.“ „The experiment verified our hypothesis.“
do not use “a” or “the” referring to a universal concept or something that has a general meaning	„Messes are often interesting.“ „Experiments form the basis of science.“
use "the" if a universal concepts is used specific	„Hygiene is important in hospitals.“ „The hygiene in the old hospital is poor.“
do not use “a” or “the” if a word indicating possession (e. g. “my, its, their”) precedes the thing you are describing	„There is a big mess on my desk.“

Guidelines for Writing Good English



Exercise: Use of the Articles “the” and “a” (Skern, 2009)

Patient-specific design of medicines (PSDM) is novel method which was first described by Smith and Jones. PSDM method is based on the conventional designs modified by using alternative gene-based protocol. Main feature of the PSDM approach is its high specificity of treatment. The principle of the PSDM approach is depicted in the Figure 1. Using PSDM method, we observe the shift in the specificity of the treatment. During the normal design of medicines, specificity is obtained from experience of the scientists. In the PSDM method, the specificity is obtained from the genes of the patient. Specificity of the PSDM method can be augmented by adding information from the family members. The PSDM method is estimated to increase specificity by factor of five.

Guidelines for Writing Good English



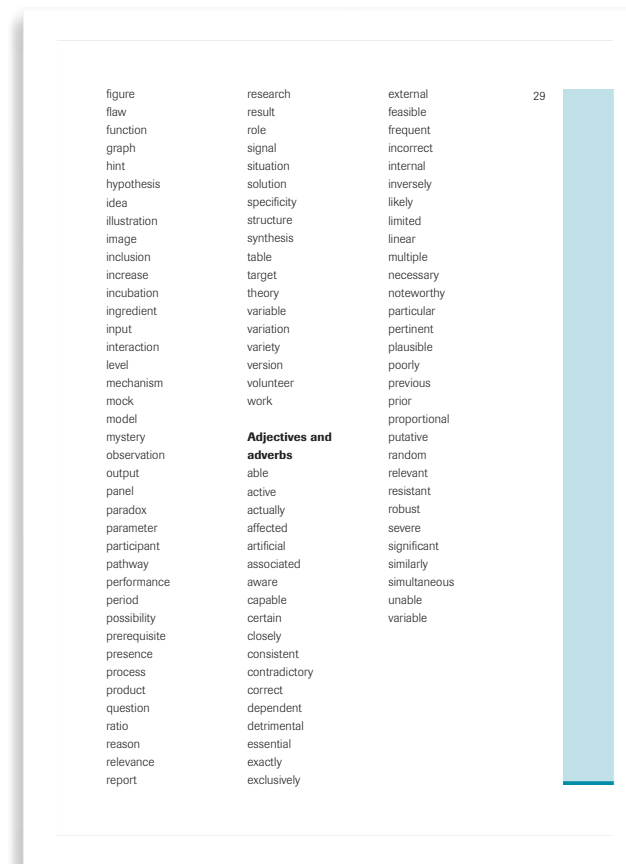
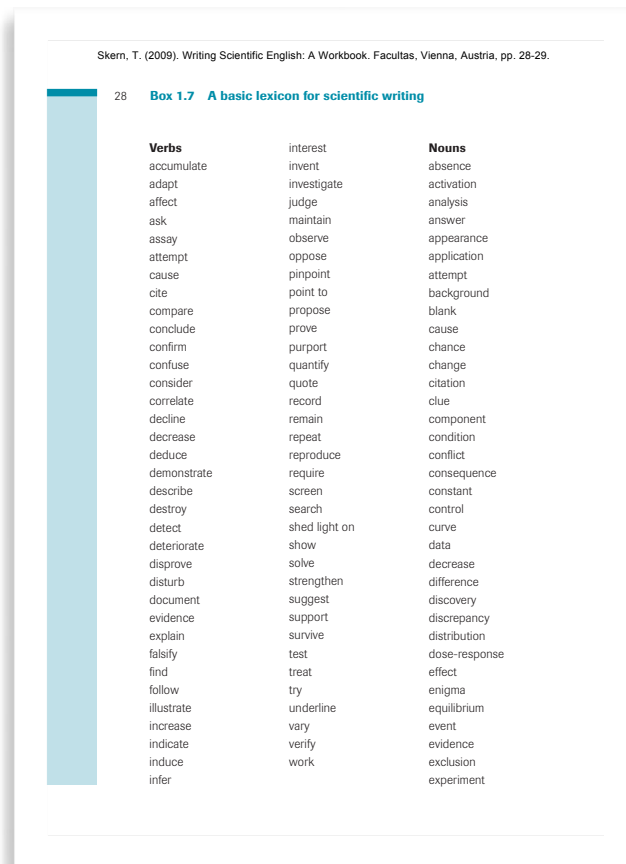
Exercise: Use of the Articles “the” and “a” (Skern, 2009)

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Guidelines for Writing Good English



Basic Scientific Lexicon



Overview

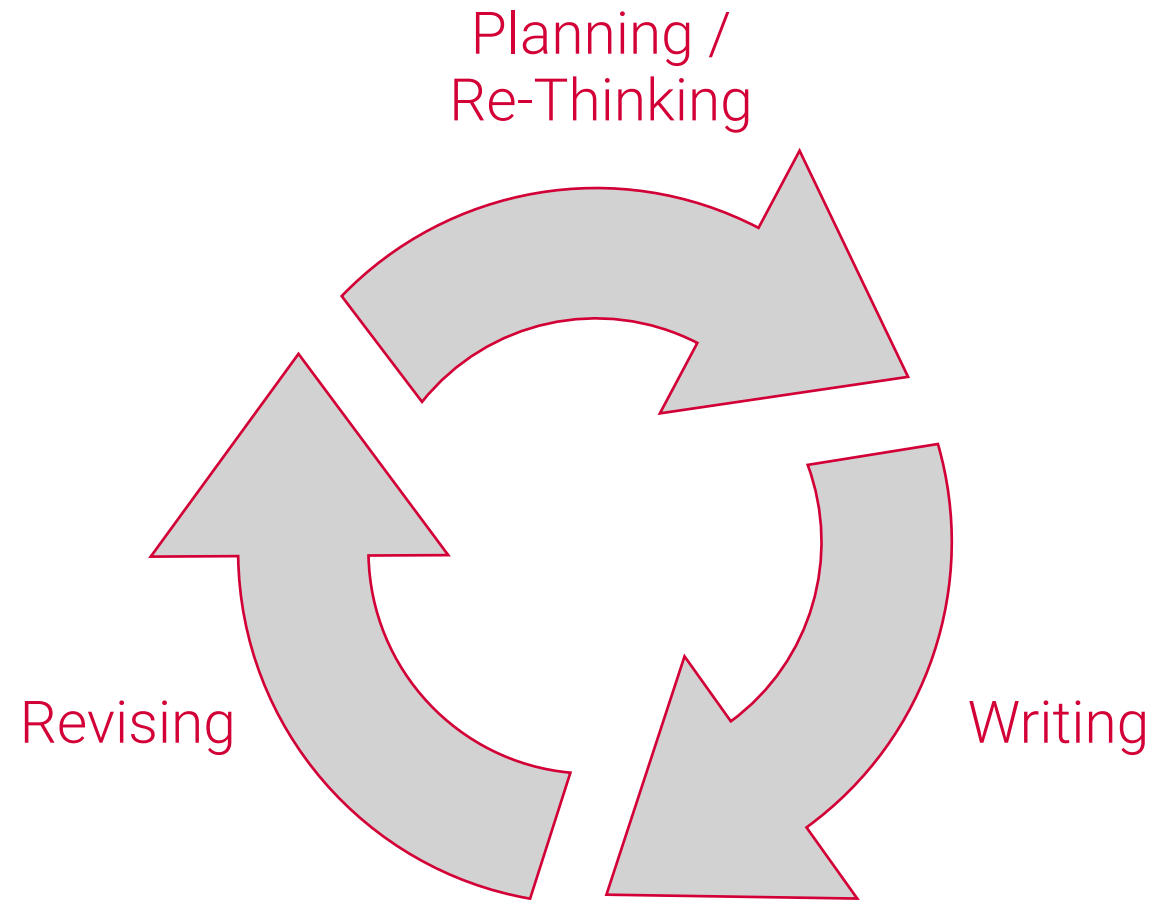
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Improving Scientific Writing Skills



- goal: transform school English into scientific English
- recommended reading: *"The Elements of Style"* by Strunk and White
 - first published in 1918
 - but: still one of the best books on writing good English
 - available for free, e.g., via www.bartleby.com/141

Writing is a Process



Planning



Before You Begin (Kelley, 2006)

- identify your audience and their expectations
- know your purpose, know your material
- understand the writing task at hand
- organize your thoughts and materials
- budget adequate time to write, revise and edit

Planning



Structure your Paper

- before writing, divide the work into sections
- for each section, make a list of the relevant points and order them according
 - each point can then be developed later into a paragraph
 - see slides from previous week for relevant points
- plan provides an initial overview, but might have to be modified later

Planning



Starting the Writing Process

- not necessary to write the paper from the first to the last chapter
- personal strategies and preferences could vary considerable
- important to make the first step easy

Planning



Common Approach

- many writers start with the **methodology**
 - relatively easy to write as it is simply descriptive
- next chapter could be the **results sections**
 - also descriptive as you simply describe your data
 - important: do not discuss or interpret the results
- then **introduction**
 - explain why you did the work
- the **discussion** is usually written last as it builds on the results section and places them into context (which was illustrated in the introduction)

Writing



Use a Clean and Legible Layout

- use justified format so that readers do not have to permanently adjust to different line lengths
- indent paragraphs to make the start of a paragraph stand out clearly
- use sub-headings when introducing a new topic

Writing



Use Paragraphs

- paragraph = collection of sentences on the same topic
- using paragraphs to collect ideas is the foundation of all writing
 - if you are not able to structure your thoughts, you will not be able to communicate them to others

Writing



Avoid Jargon and Abbreviations

- jargon = a vocabulary particular to a place of work
- the familiarity of the audience with the topic determines what is appropriate

Writing



Example (Kelley, 2006)

„For the first year, the links with SDPC and the HAC were not connected, and all required OCS input data were artificially loaded. Thus CATCH22 and MERWIN were not available.“

„Because some of the links in the computer system were not connected the first year, we could not run all the software codes.“

Writing



Define the Unfamiliar

- Abbreviations
 - when using abbreviations, define the term in its first occurrence and put abbreviations in parentheses
 - Example: *“Edgartown Great Pond (EGP) is a vital body of water. Unfortunately, due to an unpredictable influx of saltwater, the delicate ecosystem is in danger of destabilizing.”*

Writing



Define the Unfamiliar

- Unfamiliar Terms
 - when using unfamiliar terms, italicize first occurrence and define them right away
 - Example: “*Retina* is a light sensitive tissue, found at the back of the eye, that converts light impulses to nerve impulses.”

Writing



Most Important First

- place key information in main clause
- Example:

“Despite winning the game, the Patriots made several errors in the first half.”

“Despite making several errors in the first half, the Patriots won the games.” or

“The Patriots won the game, despite making several errors in the first half.”

Writing



Use Details Wisely

- specific details are desirable, but be careful to balance detail with audience needs for clarity
- significance is more important

Writing



Use Details Wisely

- Example 1

“The average house in the area has a radon level of 0.4 picocuries per liter, which is considered low by the EPA [Lafavore, 1987]. Levels between 20 and 200 picocuries per liter are considered high, and levels above 200 picocuries per liter are considered dangerous. For reference, the average radon level in outdoor air is about 0.2 picocuries per liter.”

“The average house in the area has a radon level of 0.4 picocuries per liter.”

Writing



Use Details Wisely

- engineers tend to provide as much specific detail as possible
- but: too much detail can impair the readers' understanding

Writing



Use Details Wisely

- Example 2

“The number of particular hydrocarbon combinations in our study is enormous. For example, the number of possible $C_{20}H_{42}$ is 366,319 and the number of $C_{40}H_{82}$ is 62,491,178,805,831.”

“The number of hydrocarbon combinations in our study is enormous. For example, the number of possible $C_{40}H_{82}$ is over 60 trillion.”

Writing



Use Figures and Tables Where Appropriate

- results are different from data
 - results = the meaning of the data
- most data belong in figures and tables
- text is used to point out simple relationships and describe trends
 - cite corresponding figures or tables in the text

Guidelines for Using Figures and Tables

- editors (and readers) look first (and maybe only) at titles, abstracts, and tables and figures
- like the abstract, figures and tables should stand alone and tell a complete story
 - readers should understand them without having to read the main text
- use same key terms in the title, the column headings, and the text of the paper
- ensure readability, even in printed versions
 - do make sure it can be read if converted to greyscale

Writing



Avoid Ambiguity

- choose words whose meanings are clear
- Example:

"T cells, rather than B cells, appeared as the lymphocytes migrated to the thymus gland."

"T cells, rather than B cells, appeared because the lymphocytes migrated to the thymus gland."

Writing



Write Simple Sentences

- use only one idea per sentence
- follow the rule: subject + verb + object (SVO)
 - begin with subject
 - verb and object follow straight away
- write sentences as direct or straightforward statements
 - avoid long, explanatory phrase at the beginning of a direct sentence
 - avoid marginal information somewhere in the middle

Writing



Write Simple Sentences

- simplicity also applies to the choice of words
- use strong verbs and avoid turning verbs into nouns

Category	Example	Substitute
nouns	utilization functionality	use feature
verbs	facilitate finalize	cause end
adjectives	aforementioned individualized	mentioned individual
adverbs	firstly, secondly heretofore	first, second previous

Writing



Write Simple Sentences

- Further Examples

Example	Substitute
Obtain estimates of	estimate
Has seen an expansion in	has expanded
Provides a methodologic emphasis	emphasizes methodology
Take an assessment of	assess
Provide a review of	review
Offer confirmation of	confirm
Make a decision	decide
Shows a peak	peaks

Writing



Write Simple Sentences

- simplicity also means to avoid needless words

Examples	
(already) existing	mix (together)
at (the) present (time)	never (before)
(basic) fundamentals	none (at all)
(completely) eliminate	now (at this time)
(continue to) remain	period (of time)
currently (being)	(private) industry
(currently) underway	(separate) entities
(empty) space	start (out)
had done (previously)	write (out)
introduced (a new)	(still) persists

Writing



Write Simple Sentences

- avoid too many “to be” verbs
 - e.g., “is”, “was”, “were”, “has been”, “have been”
- often “there are” is extra weight
- Example:

“There are many students who like writing.”

“Many students like writing.”

Writing



Write Simple Sentences

- avoid excess words, which slow down comprehension

Beware of	Use instead
with the possible exception of	except
due to the fact that	because
for the purpose of	for
in spite of the fact that	although
in the event that	if
one and the same	the same
period of four days	four days
personal opinion	opinion

Beware of	Use instead
all three of the	the three
fewer in number	fewer
give rise to	cause
in all cases	always
in a position to	can
in close proximity to	near
In order to	to
made arrangements for	arranged

Beware of	Use instead
made the measurement of	measured
shorter/longer in length	shorter/longer
a majority of	most
a number of	many
are of the same opinion	agree
at the present moment	now
less frequently occurring	rare
made the decision	decided

Writing



Write Simple Sentences

- avoid dead weight phrases

Examples	
in the event that	for the most part
in the nature of	for the purpose of
it has been estimated that	in a manner of speaking
it seems that	in a very real sense
the point I am trying to make	in my opinion
what I mean to say is	in the case of
it may be argued that	in the final analysis

Exercise: Shortening Sentences by Splitting Them into Two (Skern, 2009)

- *“To be a good scientist, you have to be tolerant and patient when experiments or interpretations do not turn out as you had predicted, you must be able to stand high levels of frustration.”*
- *“62% of certified drug addicts believe that cannabis has effects on the behavior of car drivers and machine operators which lengthen their reaction time, 45% of students shared this opinion and only 38% of customers interviewed at discotheques were aware of this negative effect of cannabis.”*
- *“Finally, the correlation has been clearly shown, even though not all parameters have as yet been investigated and further investigations have to be done.”*
- *“This results in texts which are extremely difficult to read as well as revealing to the world that their authors are clueless about paragraph structure.”*

Exercise: Shortening Sentences by Splitting Them into Two (Skern, 2009)

- *“To be a good scientist, you have to be tolerant and patient when experiments or interpretations do not turn out as you had predicted. You must be able to stand high levels of frustration.”*
- *“62% of certified drug addicts believe that cannabis has effects on the behavior of car drivers and machine operators which lengthen their reaction time. 45% of students shared this opinion whereas only 38% of customers interviewed at discotheques were aware of this negative effect of cannabis.”*
- *“Finally, the correlation has been clearly shown. However, some parameters remain to be examined and further investigations should be done.”*
- *“This results in texts which are extremely difficult to read. In addition, they also reveal to the world that their authors are clueless about paragraph structure.”*

Writing



Write Positive Sentences

- difference between positive and negative sentences
 - negative sentences contain words such as “no”, “not”, “none”, “nor”, “nothing” and “never”
 - positive sentences lack these words
- generally, positive sentences are easier to understand
- therefore, try to keep negative sentences to a minimum
 - might not always be possible

Writing



Write Positive Sentences

- Example: Which sentence is easier to understand?

“Scientists for whom English is not their first language should not be at a disadvantage.”

“Scientists for whom English is a second language should have the same status as native speakers.”

Writing



Write Positive Sentences

- Examples

Do not Write	Use instead
not honest	dishonest
not important	trifling
does not have	lacks
did not remember	forgot
did not pay attention to	ignored
did not have much confidence	distrusted
did not succeed	failed

Exercise: Positive and Negative Sentences (Skern, 2009)

1. The experiment did not work.
2. No changes were observed in any of the variables tested.
3. There is not a piece of evidence supporting this hypothesis.
4. The variation was never more than 1%.
5. None of the alternative explanations seemed likely.
6. Neither the fear of global warming nor the number of fatal accidents influence car drivers.
7. Nothing is dangerous about this method.
8. No-one noticed the discrepancy between the two sets of data.
9. In none of the samples could the desired compound be found.
10. No less than eleven substances were present in the mixture.

Exercise: Positive and Negative Sentences (Skern, 2009)

1. The experiment failed.
2. All variables tested remained constant.
3. This hypothesis lacks supporting evidence.
4. The variation was always less than 1%.
5. All alternative explanations seemed implausible.
6. Car drivers ignore both the fear of global warming and the number of fatal accidents.
7. This method is safe.
8. Everybody overlooked the discrepancy between the two sets of data.
9. The desired compound was absent from all the samples.
10. The mixture contained at least eleven substances.

Writing



Write Active Sentences

- goal in technical writing => communicate as efficiently as possible
- difference between active and passive sentences
 - active sentence: "We mixed A and B" is an
 - passive sentence: "A and B were mixed together"
- active sentences are more direct, shorter and clearer

Writing



Write Active Sentences

- Example 1:

“The ability of the antibiotics to inhibit bacterial growth was examined by using standard techniques.” (15 words)

“We used standard techniques to examine the ability of antibiotics to inhibit bacterial growth.” (14 words)

Writing



Write Active Sentences

- Example 2:

“The improved versions are presented in section x.” (8 words)

“Section x presents the improved versions.” (6 words)

Writing



Omit Needless Words

- Example

“The fact that many young scientists need a significant amount of practice to improve their written communication skills is a case in point. It can be seen from the diagram in Figure 1 that those students who regularly handed in written work performed at a higher level than those who did not.”

“Many young scientists need practice to improve their writing. Figure 1 shows that students who wrote regularly performed better.”

Writing



Omit Needless Words

- further example often seen in scientific manuscripts:

“It can be seen from the graph in figure x that ...” (11 words)

“Figure x shows that ...”. (4 words)

Exercise: Omit Needless Words (Skern, 2009)

1. It can be seen from Figure 1 that there is a significant correlation between the rate of growth of the incidence of cardiac-related disease and illness and the increasing frequency of the possession and use of a television.
2. It is a fact that 20% of the world's population has no clean water or enough to eat.
3. The effect of compound X on blood pressure has not yet been investigated in any detail.
4. Another important reason for this optimization is the fact that we should try to get rid of pollution.
5. Synergy will lead to a significant reduction in the amount of funding required.
6. There is a considerable, if not extensive, body of literature dedicated to demonstrating that the Earth can be considered as a spherical body traversing a circular path around a similarly shaped, although significantly larger and completely different in nature, body which is in common parlance termed the Sun.

Writing



Exercise: Omit Needless Words (Skern, 2009)

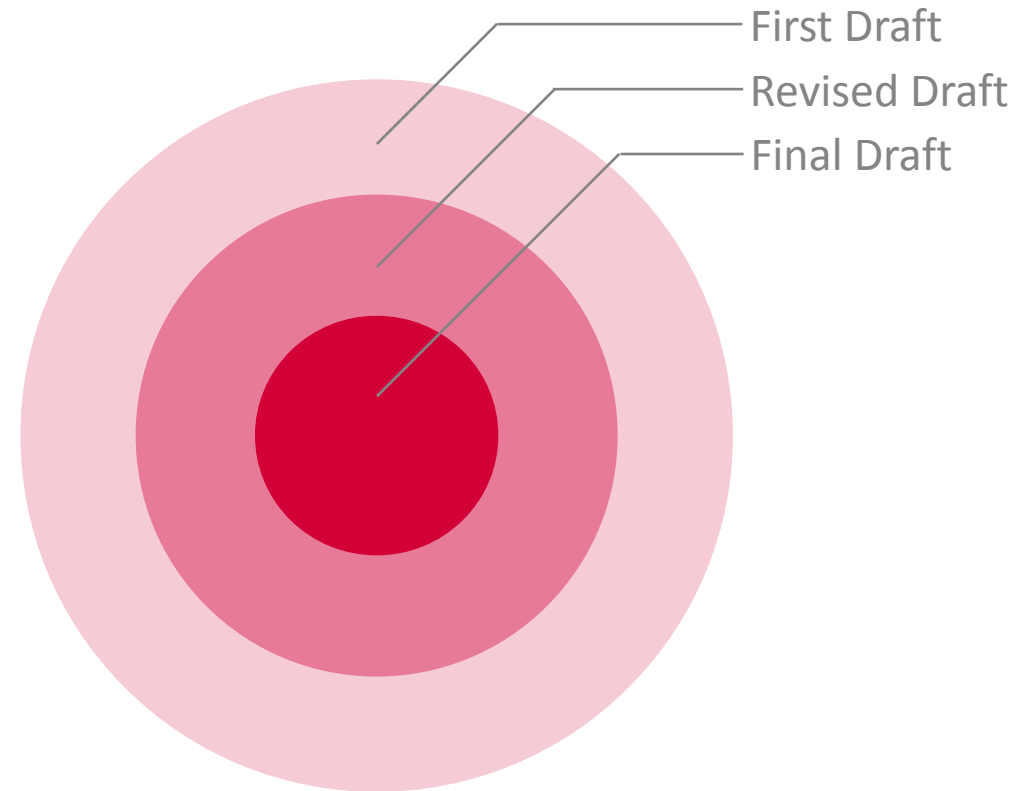
1. Figure 1 shows that the incidences of heart disease and television viewing correlate well.
2. 20% of the world population lacks clean water and sufficient food.
3. The effect of compound X on blood pressure remains to be determined.
4. Another important reason for this optimization is to eliminate pollution.
5. Synergy will significantly reduce the amount of funding required.
6. Much work has demonstrated that the spherical Earth travels around the similarly shaped Sun.
(or: The Earth orbits the Sun.)

Revising



Writing is a Process

- good writing does not happen overnight
- learning and improvement requires self reflection and feedback from others
- there are no shortcuts, only practice makes perfect



Revising



Revising the Paper

- read it out aloud
 - even better: get someone else to read it
- if you find it hard to speak then something is wrong with the text
- example:
 - *"A new process for eliminating nitrogen oxides from diesel exhaust engines is presented. Flow tube experiments to test this process are discussed. A chemical reaction scheme to account for this process is proposed."*
 - *"We present a new process for eliminating nitrogen oxides from the exhaust of diesel engines. To test this process, we performed experiments in flow tubes. To explain this process, we developed a scheme of technical reactions."*

Literature Review



Relevant Sources

- ACM Digital Library: <https://dl.acm.org>
- IEEE Xplore: <https://ieeexplore.ieee.org>
- Springer: <https://link.springer.com>
- Google Scholar: <https://scholar.google.de>

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Upcoming Deadlines



- deadline for **draft paper**: 03.11.2022
 - name document “draft_paper_<last name>_<first_name>.pdf”
- **1st check-in** (10.11.2022)
 - individual appointments for feedback on draft paper

Summary

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