

Clarity and Precision*

Biology 5700

Summary

Delete clutter

Replace long-winded words and phrases with simpler words.
Avoid jargon, doublespeak and bureaucratis

Construct clear sentences

1. Express the core of the message in the subject, verb and completer

Put action in the verb

- (A) Action inappropriately in the subject of the sentence,
 - (B) Action inappropriately in the object
 - (C) Action inappropriately in a prepositional phrase
- How to find action that is not in the verb

2. Noun Clusters.

- (B) Adjective added to a noun cluster
- (C) Noun being modified missing from the noun cluster

3. Don't Put Too Many Ideas in One Sentence

4. Antecedents of Pronouns Should be Clear

- (A) There may be more than one antecedent
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5. Put Parallel Ideas in Parallel form

Three problems in writing comparisons

- (A) Overuse of "compared to"
- (B) Comparison of unlike things
- (C) Absolute statements disguised as comparisons

Problems with Parallelism

* This is a summary made from the following references:

Moore, R. 1992. *Writing to Learn Biology*, Saunders, Fort Worth.
Woodford, F.P. 1986. *Scientific Writing for Graduate Students*, Council of Biology Editors, Inc. Bethesda, Maryland
Zeiger, M. 1991. *Writing Biomedical Research*, McGraw-Hill, Inc., New York.

Clarity and Precision*

To achieve clarity and precision, use words only when they are needed and construct sentences carefully so that the action is in the verb.

Delete clutter

The following words add nothing to a paper and should always be left out.

as you know	needless to say
I might add that	it is worth noting that
when time permits	as already stated
it goes without saying	from this point of view
it is relevant to mention that	it is of interest to note that
we would like to emphasize that	surely
It is important to state here	doubtless
it appears that	as a matter of fact
as such	for the sake of
in the case of	in some instances
take this opportunity	the fact that
the reason is	a distance of
a period of	as of this date
in a very real sense	in my opinion
quite	as a matter of fact
it stands to reason that	it has been shown that
it has been demonstrated that	it must be remembered that
it may seem that	it is worthy to note that
it is clear that	it may be mentioned that

Replace long-winded words and phrases (below left) with simpler words (on the right).

Long phrase

Simple replacement

make an adjustment	adjust
afford an opportunity to	allow
additionally	also
in all cases	always
it is apparent that	apparently
owing to the fact that	because
give rise to	cause
give an account of	describe
with the exception of	except
bring to a conclusion	finish
on behalf of	for
in the event that	if
a considerable number of	many

at the present time	now
call attention to the fact that	remind
in the not-too-distant future	soon
after this has been done	then

Avoid jargon, doublespeak and bureaucratise

Jargon consists of words that are meaningless. These words are often borrowed from a discipline where they have a precise meaning, and are used in another discipline where they have lost this meaning (Woodford, 1986).

Example: "To approximate" has a precise meaning in mathematics but is often given a different meaning in scientific writing (e.g., "Optimal reaction conditions were approximated when..").

Other examples:

1. Fused silicate container - glass beaker.
2. Poorly buffered precipitation - acid rain.
3. Atmospheric deposition of anthropogenetically derived acid substances - acid rain.
4. "In studies pertaining to the identification of phenolic derivatives, drying of the paper gives less satisfactory visualization,"
means
"Phenolic derivatives are more easily seen and identified if the paper is left wet."

Doublespeak is used to confuse the reader, and to cover up inadequacies.

Examples:

1. "Clean up the oil spill" becomes "Make the area environmentally stable".
2. Potholes are "pavement deficiencies"
3. Poor people are "fiscal underachievers"
4. Guards in department stores are "loss prevention specialists."
5. Gas station attendants become "petroleum transfer engineers."
6. Companies don't talk of losses but of "negative growth."
7. "Nothing is certain in life except negative patient care outcome and governmental revenue enhancements."

Bureaucratise is often found in government and universities.

Examples:

1. The US Department of Health Education and Welfare requested \$23,000 for:
"the evaluation and parameterization of stability and safety performance characteristics of two- and three-wheeled vehicular toys for riding."
They wanted to study how children fall off of bicycles and tricycles.
2. The Arizona Career Ladder Research and Evaluation Project studied:
"Matrices depicting positive anecdotes related to interrelated organizational focus."
This was: How a teacher's salary affects student morale and performance.

Construct clear sentences

Five problems that commonly interfere with simplicity (summarized from Zeiger, 1991):

1. not expressing the core of the message in the subject, verb and completer
2. piling nouns into noun clusters
3. packing too many ideas into one sentence
4. having unclear antecedents of pronouns
5. not putting parallel ideas in parallel form

1. Express the core of the message in the subject, verb and completer

The sentence is most likely to be simple and direct if the subject, verb and completer convey most of the message. The topic is what the sentence is talking about. The action is what the topic is doing or what is being done to it. Make the topic of the sentence into the subject of the sentence and put the action of the sentence in the verb.

Example:

"The children with arteriovenous shunts had the shunts opened, heparin injected, and the arterial and venous sides of the shunt clamped."

The subject and verb of the sentence are *children had*. But the topic of the sentence is not children, and the message is not about children having something (as it would have been for "the children has diabetes mellitus") This sentence has three topics - shunts, heparin and the sides of the shunt - and the message of the sentence is about what happened to them. Therefore these should be the subjects of the sentence.

Revision:

"In the children who had arteriovenous shunts, the shunts were opened, heparin was injected, and the arterial and venous sides of the shunt were clamped."

In each sentence, establish the subject of every verb. Ensure that the subject, if present, is in the right context or, if absent or represented by a pronoun, is unambiguously implied.

Example:

"The flask was flushed with nitrogen to remove ozone."

The intended subject of the verb "remove" is "the experimenter" but this subject is not mentioned. Grammatically, therefore, the implied subject of that verb must be the subject of the main clause - "flask". The best correction is usually to insert the true subject of all verbs, namely "we".

Revision:

"We removed excess ozone by flushing the flask with nitrogen."

Passive Voice

Scientists weaken their writing and make it dull when they use the passive voice (Moore, 1992; Zeiger, 1991; Woodford, 1986).

Example:

When a scientist speaks of his work he might say:

"We wanted to understand how penicillin affects growth of bacteria. To do this, we grew bacteria in the presence of varying concentrations of penicillin. We learned that penicillin inhibits growth of bacteria."

The same scientist might write:

"The growth of bacteria was studied. Bacteria were grown in the presence of varying concentrations of penicillin. It was learned that bacterial growth is inhibited by penicillin."

Examples:

1. "There was considerable erosion of the land by the floods."
"Floods eroded the land"
2. "The patients were examined by the physicians"
"The physicians examined the patients"
3. "Papers are written by students."
"Students write papers."
4. Famous example of the use of active voice. Watson and Crick
"We wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.)"

Put action in the verb

Verbs express action. If the action of a sentence is expressed by the main verb, the sentence is easy to understand. If the action is expressed in a noun, the sentence is difficult to understand.

Three common ways of expressing action in a noun instead of in a verb are:

1. to put the action in the *subject* of the sentence,
2. to put the action in the *object* of the verb
3. to put the action in a *prepositional phrase*

(A) Action inappropriately in the subject of the sentence,

Example: "An increase in heart rate occurred."

Revision: "Heart rate increased."

In this example, the verb "occurred" does not express the action of the sentence. Instead, the subject of the sentence (increase) expresses the action.

As a result the grammar does not coordinate with the meaning and the sentence is complicated and indirect.

To revise a sentence whose action is in the subject:

1. Omit the subject and the preposition that follows it (here "increase in")
2. Replace the vague verb (here "occurred") with the action from the omitted subject (here "increase")

becomes "increased")

(B) Action inappropriately in the object

Example: "The new drug caused a decrease in heart rate."

Revision: "The new drug decreased heart rate."

The action is expressed by the object (decrease) and the true object (heart rate) is sidetracked into a prepositional phrase. To revise a sentence like this, omit the verb and make a new verb from the object.

(C) Action inappropriately in a prepositional phrase

Prepositions: of, for, on, in, to, with

Example: "With bilateral leg vessel congestion, the compliance of forearm vessels increased significantly."

Revision: "When the vessels in both legs were congested, the compliance of forearm vessels increased significantly."

The action in the first part of the sentence is expressed in the object of a preposition "congestion" the object of "with", and there is no verb. As a result the sentence is dense and difficult to read. The sentence becomes clearer when the action is expressed by a verb and when the vague term "with" is replaced by the precise term "when"

Example: "With hypoxia of longer duration or severer degree, the shortening phase may get progressively briefer."

Revision: "When hypoxia lasts longer or is more severe, the shortening phase may get progressively briefer."

The crucial factor for clarity in a sentence is expressing action in a verb.

How to find action that is not in the verb

1. Look for weak verbs, such as occurred, showed, caused, produced, was achieved, was observed, was noted.
2. Look for nouns made from verbs. e.g. prolongation, inhibition, formation, measurement, assessment, occurrence, existence, removal.
3. Look for "increase" or "decrease" used as nouns instead of as verbs.
Example: "An increase in heart rate occurred."
4. Look for "with" followed by a noun made from a verb
Example: "With the occurrence of increases...."

Table 1 Warning Words (from Woodford, 1986)

Warning words that indicate a trapped verb nearby. When you see these check your sentence and make sure it still has an active verb. These are not invariably undesirable words, but are signals that something may be amiss.

Colourless verbs (usually to be eliminated; they occur most commonly as the past participle, as shown)

accomplished	experienced	obtained
achieved	facilitated	occurred
attained	given	performed
carried out	implemented	proceeded
conducted	indicated	produced
done	involved	required
effected	made	

Woolly words (sometimes these have a precise meaning; more often, they are an indication that the thought has to be sharpened)

area	problem	character
process	conditions	situation
field	structure	level
system	nature	

Words incorrectly used as synonyms

amount	alternate	minimal	varying
concentration	alternative	negligible	various
content		slight	varied
level			different

2. Noun Clusters.

One noun is commonly used to modify another. Examples include "blood flow", "protein metabolism", "lung function" and "ion concentration". But adding another noun onto an already existing noun pair is confusing.

Example: "filament length variability"

Revision: "variability of filament length"

Example: "air spaces phospholipid pool"

Revision: "phospholipid pool in the air spaces"

Example: "liver disease plasma" could mean
 "diseased plasma flowing through the liver" or
 "hepatic plasma in disease" or

plasma obtained from patients with liver disease.

Example: *heavy beef heart mitochondria protein* Which is heavy?

Example: *nonglucose light experiments* should be changed to *experiments carried out in the light in the absence of glucose*

(A) Adjective added to a noun cluster

The problem is compounded when an adjective is added to a noun cluster.

Example: *chronic sheep experiments*
What is chronic, sheep or experiments?

Revision: *chronic experiments in sheep*

Example: *peripheral chemoreception stimulation*
Revision: *stimulation of the peripheral chemoreceptors*

(B) Noun being modified missing from the noun cluster

Example: *To assess for zero drift, we checked each catheter in saline at 38°C.*

What is zero drift? It sounds like no drift but actually it means drift of the zero point.

Revision: *To assess for drift of the zero point, we checked each catheter in saline at 38°C.*

3. Don't Put Too Many Ideas in One Sentence

Short sentences are easier to understand than long sentences. Do not string too many ideas together in the same sentence.

Example: *To study the mechanisms involved in the beneficial effects of hydralazine on ventricular function in patients who have chronic aortic insufficiency, a radio-nuclide assessment of ventricular function was performed in 15 patients with pure aortic insufficiency, functional capacity I or II at rest and during supine exercise.*

In the example, three ideas are presented in one sentence: the purpose of the experiment, how the experiment was done, and a description of the patients. Furthermore the description of the patients is nested inside the explanation of how the experiment was done. It is best to pull all three ideas out into different sentences.

Revision: *Our aim was to assess the mechanisms involved in the beneficial effects of hydralazine on ventricular function in patients who have chronic aortic insufficiency. For this assessment, we did a radionuclide study of ventricular function in 15 patients at rest and during supine exercise. All patients had pure aortic insufficiency and were in functional capacity I or II.*

4. Antecedents of Pronouns Should be Clear

An antecedent is a word that a pronoun refers to.

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Example: "We used these methods because they enabled us to measure loss of microspheres under conditions that are normally used to assess blood flow.

"Methods" is the antecedent for the pronoun "they", and "conditions" is the antecedent of the pronoun "that". If the antecedent is unclear, the reader may have trouble understanding the sentence. The antecedent of a pronoun can be unclear for at least two reasons.

(A) There may be more than one antecedent

Example: "The presence of disulfide bonds in oligopeptides may restrict the formation of ordered structures in sodium dodecyl sulfate solution. Once they are reduced the predicted conformation can be fully induced."

In this example, "they" is ambiguous. It could refer to either "bonds" or "structures" or even "oligopeptides". To make the meaning clear, the possible solutions are to revise the sentence structure or to repeat the noun. Here the simplest solution is to repeat the noun.

Revision: "The presence of disulfide bonds in oligopeptides may restrict the formation of ordered structures in sodium dodecyl sulfate solution. Once the bonds are reduced, the predicted conformation can be fully induced."

Example: "Laboratory animals are not susceptible to these diseases, so research on them is hampered."

Revision: "Laboratory animals are not susceptible to these diseases, so research on these diseases is hampered."

Revision 2 "Research on these diseases is hampered because laboratory animals are not susceptible to them."

(B) There may be no antecedent

This occurs when the word "this" is used alone at or near the beginning of a sentence to refer to a concept implied in the previous sentence.

Example: "Tyson et al. abruptly occluded the venae cavae before analyzing the heart beats. As a result of this, the volume of the right heart rapidly decreased."

Revision: "Tyson et al. abruptly occluded the venae cavae before analyzing the heart beats. As a result of this procedure, the volume of the right heart rapidly decreased."

Revision 2 "Tyson et al abruptly occluded the venae cavae before analyzing the heart beats. As a result of this occlusion, the volume of the right heart rapidly decreased."

5. Put Parallel Ideas in Parallel form

Parallel ideas are ideas that are equal in logic and importance. Parallel ideas should be written in parallel form, either as a pair or as a series. If ideas are expressed in parallel form, the form of the first idea prepares the reader for the form of the next idea. As a result, readers can concentrate all of their

attention on the ideas, not on the form.

Example: the groups of words after "but" is in the same form as the group before.

*Cardiac output decreased by 10% but blood pressure was unchanged

*Cardiac output decreased by 10% but heart rate increased by 20%

*Cardiac output decreased by 10% but blood pressure decreased by only 10%

Example: "We hoped to increase the complete response and to improve survival."

Example: "In dogs, about 20% of plasma glucose carbon is recycled via tricarbon compounds either in cold or at neutral ambient temperature."

If parallel ideas are not written in parallel form, the logical relation of the ideas (similarity, alternatives, contrast, comparison) is obscured.

Example: "This lack of response could have been due to damage of a cell surface receptor by the isolation procedure, but it could also be that isolated cells do not respond normally because the cells are isolated."

In this sentence, the groups of words before and after "but" are not parallel, so it is not immediately obvious that the second half of the sentence is giving another possible reason for the lack of response.

Revision 1 "This lack of response could have been due to damage of a cell surface receptor by the isolation procedure, but it could also have been due to the fact that isolated cells do not respond normally because they are isolated."

Revision 2 "This lack of response could have been due to damage of a cell surface receptor by the isolation procedure or simply to the fact of isolation, which could alter normal cell responses."

Three problems in writing comparisons

(A) Overuse of "compared to"

In comparisons containing a comparative term, such as "higher," "greater," "lower," "less," the accompanying term should be "than" not "compared to."

Example: "We found a higher K_o at 37°C compared to 25°C."

Revision: "We found a higher K_o at 37°C than at 25°C."

Don't use "compared to" with "decreased" or "increased"

Example: "Experimental rabbits had a 28% decrease in alveolar phospholipid as compared to control rabbits during normal ventilation."

This sentence is ambiguous.

Revision 1 "Experimental rabbits had 28% less alveolar phospholipid than did control rabbits..."