

# Scientific Writing & Specific Aims Pages

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## Part 1: Specific Aims Pages: The Fundamentals

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### Readability and Understanding

- Describe your research in terms that are easily understood
  - NIH encourages readability by: peer reviewers, scientists, Congress, and the public
- Whenever possible, convey the value of your research in plain language that is clear, succinct, and professional.

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### Thinking Like a Reviewer

- Organize your information where reviewers expect to find it.
  - Effortlessly guide readers through
  - Don't give reviewers any reason to stop reading
- Think like a reviewer
  - An intense amount of reading to do
  - Clear, well-written, properly organized information makes reviewers' jobs easier

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### One Point Per Unit

- Paragraphs:
  1. The Problem
  2. Proposed Solution
  3. The Plan
  4. The Payoff
- Sentences:
  - Simple, single point
  - NIH: 20 words or fewer

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### Get to the Point

- Use the Active Voice
  - YES: We will develop an experiment
  - NO: An experiment will be developed.
- Be Concise
  - Cut out everything unnecessary
  - Be as direct as possible
  - Avoid unnecessary repetition/redundancy

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## Don't Obfuscate

- Use Simplest Terms (Possible)
  - No unnecessary jargon or excessive language
- Be Consistent
  - Terms, references, writing style
- Balance Acronym/Abbreviation Use
  - Only when needed
  - Always spell out on first use

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## Give Yourself an Advantage

- Bullets and Numbered Lists
  - YES: To effectively organize
  - NO: If it seems out of place
- Bold and Underline
  - To highlight key concepts and allow scanning
  - Strategically, sparingly

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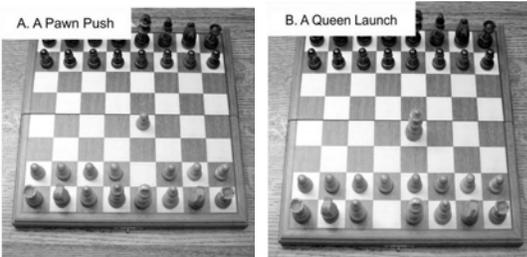
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## About That First Sentence



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**About That First Sentence**

- Grab interest and establish proposal relevance
- Queen Launch instead of Pawn Push
  - Lung cancer is the leading cause of cancer deaths among both men and women in the U.S.
    - *States the obvious, non-focused, no relevance*

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**About That First Sentence**

- Grab interest and establish proposal relevance
- Queen Launch instead of Pawn Push
  - Failure to identify regional lymph node metastases in the 40,000 U.S. patients/year with surgically resected lung cancer is associated with a three-fold increase in recurrence and decreased overall survival
    - *Focused, adds information, identifies problem, and relates to specific agency mission*

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**About Those Aims Sentences**

- Conceptual is better than Descriptive
- Why instead of just What
  - OKAY: To test the hypothesis that neurons in the GluR1 knockout mouse will have delayed dendritic maturation
  - BETTER: To test the hypothesis that GluR1 signaling is necessary\* for dendritic maturation (\*or sufficient)

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Part 2:  
**Reader Expectations:  
Give Readers What They Want**

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**Reading is Hard**

- Readers will do what readers will do
- Every unit of discourse is infinitely interpretable
- Mental energy is required to process each unit of discourse
- Readers perform two mutually dependent tasks when they read:
  - Perception of structure
  - Comprehension of substance

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**Readers Have Expectations**

- Readers have fixed expectations of where to look in the structure of every discourse unit for specific types of substance.
  - Storytellers introducing main characters
  - IMRaD
- If a reader does not understand a text, it is the writer's fault.

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## Readers Have 5 Questions

Five Questions a reader needs answered in every sentence:

- 1) What is going on? (Action)
- 2) From whose perspective? (Subject)
- 3) How does this link back to the previous sentence?
- 4) How does this lean forward to the next sentence?
- 5) What words should I read with extra emphasis?

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Reader Expectations:

**Topics, Verbs, Stress**

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## Topic Position Expectations/Needs

- Readers **expect**: a story about whoever shows up first in a sentence (topic position).
- Readers **need**: linkage and context (old/known information) in this topic position before being introduced to new information.

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### The Topic Position

- Place the person or thing whose “story” a sentence is telling at the beginning of the sentence, in the topic position.
- The particular ideas toward the beginning of sentences define what a passage is about for a reader
  - Bees disperse pollen
  - Pollen is dispersed by bees

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### The Topic Position

- It’s strikingly easy to bury the sentence subject:

Using the data collected above, ACR and SLICC classification criteria for SLE will be documented for those patients with skin-limited DLE at baseline to evaluate the phenotype of SLE including the presence or absence of organ-specific disease.

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### The Topic Position

- It’s strikingly easy to bury the sentence subject:

Further, our group has recently utilized national health survey data to identify that children with atopic dermatitis, specifically, those with more severe atopic dermatitis, have higher rates of bone, muscle, and joint problems.

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### Verb Expectations/Needs

- Readers **expect** a grammatical subject to be followed immediately by its verb because they **need** syntactic resolution.
- Furthermore, readers **expect** the action of the sentence to be articulated by that verb

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### Subject-Verb Separation

- Follow a grammatical subject as soon as possible with its verb.
  - Such an objective prospective study, **directly looking at bone health in children**, has not yet been done.

(Not that bad, really.)

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### Subject-Verb Separation

- Try out these ones, though:
  - However, sparse high-quality information **that directly addresses the association between allergic conditions and musculoskeletal problems within the pediatric population** is available.
  - This and other research experiences **relevant to my long-term goal of developing and implementing geriatric injury prevention interventions** give me unique insights.

(ouch)

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### Locating the Action

- Articulate the action of every clause/sentence with its verb:
  - If there could be the presentation of data that would indicate the representation of the status of the problem was accurate, then a decision could be made.

(Nominalizations!)

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### Locating the Action

Transcription of the 5S RNA genes in the egg extract **is** TFIIIA-dependent. This **is** surprising, because the concentration of TFIIIA **is** the same as in the oocyte nuclear extract. The other transcription factors and RNA polymerase III **are presumed to be** in excess over available TFIIIA, because tRNA genes **are transcribed** in the egg extract. The addition of egg extract to the oocyte nuclear extract **has** two effects on transcription efficiency. First, there **is** a general inhibition of transcription that **can be alleviated** in part by supplementation with high concentrations of RNA polymerase III. Second, egg extract **destabilizes** transcription complexes formed with oocyte but not somatic 5S RNA genes.

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### Locating the Action

- List of verbs in previous passage:
  - **Is, is, is, are presumed to be, are transcribed, has, is, can be alleviated, destabilizes.**

(Whaaaaaa?)

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### Stress Position Expectations/Needs

- Readers **expect** each unit of discourse (whether a clause, sentence, article, or book) to make a single point.
- In the case of a sentence, readers **need**: syntactic closure and fulfillment in the stress position.

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### The Stress Position

- It is a linguistic commonplace that readers naturally emphasize the material that arrives at the end of a sentence
- A sentence is too long when it has more viable candidates for stress positions than there are stress positions available.

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### The Stress Position

- Stress Position Problem:

One recent study of 34,500 adults aged 18 to 85 from the 2012 National Health Interview survey found that adults with eczema had a higher incidence of fractures and other bone or joint problems as compared to subjects without eczema and another that one third of adults with moderate to severe AD to have lower bone mineral density (BMD) than those without AD

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### Known-New

- In general, provide context for your reader before asking that reader to consider anything new...

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### Known-New

- Place appropriate “old information” (material already stated in the discourse) in the topic position for linkage backward and contextualization forward.
  - Avoid Logical Gaps – Don’t assume readers can (or should have to) make the same leaps between information that you can.
- Consider how the new information in the stress position leans forward to connect to the next sentence.

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### In Review

- Subject in the Topic Position (beginning)
  - Known information in the Topic Position/Link back to previous sentence
- Verb as close as possible to the subject
- Action articulated in the verb
- Readers emphasize stress position
  - New, emphasized information in Stress Position to lean forward

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Part 3:  
**Clarity & Concision:**  
**Less Friction, More Momentum**

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Tautology: The saying of the same thing twice in different words

**Eliminate Redundancies**

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**Eliminate Redundancies**

- We all write redundantly
- The goal is not (necessarily) to change the way you write, but to improve the way you edit.
- Wordiness causes friction; good scientific writing needs momentum.

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## Eliminate Redundancies

|                         |                     |
|-------------------------|---------------------|
| (already) existing      | introduced (a new)  |
| (alternative) choices   | 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)   | (still) persists    |
| (end) result            | (final) outcome     |
| (various) differences   | each (individual)   |

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## Eliminate Redundancies

- Tautological Example:

PHQ-9 data collection for the study occurred in 15 eQUIRENet organizations (representing over 200 clinicians) over a period of approximately three to four months. These organizations collected over 4,000 PHQ-9s during this short period of time.

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It is interesting to note that...

## Eliminate Writing Zeroes

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## Eliminate Writing Zeroes

- Some phrases offer almost no meaning or valuable information

It is interesting to note that measures of depression symptoms and severity, medication adherence, and medication-related side effects are poorly documented in the EHR.

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## Eliminate Writing Zeroes

~~It is interesting to note that~~ measures of depression symptoms and severity, medication adherence, and medication-related side effects are poorly documented in the EHR.

- If it's not interesting...
- If it's more interesting...

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## Eliminate Writing Zeroes

|                               |                     |
|-------------------------------|---------------------|
| The presence of               | As a matter of fact |
| It should be pointed out that | I/we might add that |
| It is noteworthy that         | In the course of    |
| It is significant that        | The fact that       |

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## Eliminate Writing Zeroes

- Zero Example:

Our hypothesis is that pediatric-onset discoid lupus is a heterogeneous disease, but specific clinical and laboratory markers including the presence of auto-antibodies and generalized skin disease will help to identify those at greatest risk for progression to SLE.

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## Eliminate Writing Zeroes

- Zero Example:

Other potential limitations of the proposed project will be directly related to the fact that eligible patients will all be taking an antidepressant to treat depression.

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## Eliminate Writing Zeroes

- Expletives
  - It + is/was
  - There + is/are/was/were
- Can be rhetorically effective for adding emphasis
- Overuse leads to unnecessary wordiness

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## Eliminate Writing Zeroes

- Expletive Example:

Despite being the most commonly prescribed treatment, there is no evidence to support the use of topical corticosteroids in morphea

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Use only words that are absolutely necessary

## Reduce Sentences to Their Simplest Forms

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“Substitute 'damn' every time you're inclined to write 'very;' your editor will delete it and the writing will be just as it should be.”

— Mark Twain

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## Reduce: Keep it Simple

- Simple doesn't mean all simple sentences (a single subject and verb)
  - Only necessary words
  - More momentum, less friction

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## Reduce Sentences to Their Simplest Forms

### CIRCUMLOCUTIONS

#### Bulky

At this point in time  
At that point in time  
Has the ability to  
Has the potential to  
In light of the fact that  
In the event that  
In the vicinity of  
Owing/due to the fact that  
The question as to whether  
There is no doubt but that

#### Trim

now  
then  
can  
can  
because  
if  
near  
because  
whether  
no doubt

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## Reduce: Keep it Simple

- Circumlocutions may resemble the Writing Zeroes, but...
  - Can be trimmed
  - Still add momentum

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## Reduce: Keep it Simple

- Circumlocution Example:

Therefore, the proposed intervention has the potential to be much more widely utilized in diverse clinical settings.

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## Reduce: Keep it Simple

- Needlessly Complex Words

| <u>Complex</u>  | <u>Possible Substitute</u> |
|-----------------|----------------------------|
| Familiarization | Familiarity                |
| Utilization     | Use                        |
| Facilitate      | Cause                      |
| Finalize        | Finish/End                 |
| Utilize         | Use                        |
| Individualized  | Individual                 |
| Amongst         | Among                      |

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## Reduce: Keep it Simple

- Nominalizations: verbs turned into nouns
  - They attract unnecessary adjectives, adverbs, and prepositional phrases
  - Use the verb hidden in the noun form instead

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## Reduce: Keep it Simple

- Nominalizations:
  - Establishment, measurement, development, collection, discovery, movement, reaction, completion, failure, refusal, discussion, investigation...

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## Reduce: Keep it Simple

- Nominalizations:

This example provides an illustration of the problems with nominalizations.

(This example **illustrates**...)

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## Reduce: Keep it Simple

- Nominalizations:

If there could be the presentation of data that would indicate the representation of the status of the problem was accurate, then a decision could be made.

(If [subject] **presents** data indicating that [he/she] accurately **represented** the status of the problem, [new subject] can **decide**...)

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## Reduce: Keep it Simple

- **Nominalizations:**

Better characterization of the clinical features of children with melanoma and NMSC (Aim 1) is key to enhancing our understanding of the presentation of these cancers in children, which can improve detection

What do you think: Fine? Not fine?

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Easy as 1, 2, 3...

## Editing Tips for Clarity & Concision

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## Reduce: Keep it Simple

- **Tip 1:** Dedicate one read-through solely to cutting. No additions allowed.
- **Tip 2:** Use the Find/Search feature in Word/Adobe to hunt wordiness down
- **Tip 3:** Search and/or circle:
  - Redundancies and Zeroes you *know* you're prone to
  - Any instance of expletives (it + be or there + be)
  - Any preposition beginning a phrase
  - Adverbs, especially 'very' and 'really'

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# Specific Aims Pages

## First Paragraph/Section/Part: The Problem

- Opening Sentence/Hook: Grab interest and establish relevance of proposal
  - Ideally: to a specific (NIH) Institute mission and priorities
- Summarize Current Knowledge
  - Less-expert panel members need this
- Identify Knowledge Gap
  - Significance: What *must* be solved?
- Identify Problem Associated with Knowledge Gap

## Second Paragraph/Section/Part: The Solution

- Long-Term Goal
  - Acknowledge a continuum of research needed/Big Picture
- Overall Project Goal/Objective that addresses Knowledge Gap and begins to achieve Long-Term Goal
  - Must link back to the Knowledge Gap and emphasize product, not process
- Central Hypothesis
  - Links to Objective: Objective will be accomplished via Central Hypothesis
- Rationale
  - Why conduct the proposed research? What will be possible after?
- Qualifications and Research Environment
  - If relevant: Highlight unique team qualifications, quality of quantity of preliminary data, special skills/technologies

## Third Paragraph/Section/Part: The Plan

- 2-4 Specific Aims in bulleted or numbered list
  - Correlated to Central Hypothesis
- Conceptual rather than Descriptive
  - Whenever possible: Address Why instead of just What
- Provide clear purpose, working hypothesis, and expected outcome for each
- Avoid Aims that are dependent upon successful completion of another Aim

## Fourth Paragraph/Section/Part: The Payoff

- Statement of innovation or novelty
- Expected Outcomes that validate Central Hypothesis and fill critical need
  - Ideally: at least one per aim
- Summary of project significance and positive impact of findings

# Reader Expectations: Writing Sentences That Work for Readers

Readers have fixed expectations of where to look in the structure of every discourse unit – from a sentence to a paragraph to an entire essay – for specific types of substance. For example, most stories don't wait until the end to introduce the main character. In scientific writing, it's not appropriate to place the Results of an empirical study in the Introduction. Placing information where readers expect to find it increases the likelihood of messages being understood and helps prevent misinterpretation.

Below are 5 tips for writing sentences that work for readers:

- 1. Place the person or thing whose "story" a sentence is telling at the beginning of the sentence, in the Topic Position**
  - Use subjects to name the characters in your "story"
  - Begin sentences constituting a passage with consistent topics/subjects
- 2. Follow a grammatical subject as soon as possible with its verb**
  - Avoid long introductory phrases and clauses
  - Avoid long abstract subjects
  - Avoid interrupting the subject-verb connection
- 3. Articulate the action of every clause or sentence in its verb**
  - Beware too many To Be verbs (is/are...)
- 4. Place appropriate old information – known material already stated in the discourse – in the Topic Position**
  - Provide context for readers before asking them to consider anything new
  - This information should link backward to the previous sentence
- 5. Place new information – words you want readers to emphasize – at the ends of sentences, in the Stress Position**
  - Push new, complex units of information to the ends of sentences
  - This information should lean forward to the next sentence

# Clarity and Concision in Scientific Writing

## 1. Eliminate Redundancies/Tautologies

|                         |                       |                       |
|-------------------------|-----------------------|-----------------------|
| (already) existing      | introduced (a new)    | (empty) space         |
| (alternative) choices   | mix (together)        | start (out)           |
| at (the) present (time) | never (before)        | had done (previously) |
| (basic) fundamentals    | none (at all)         | (still) persists      |
| (completely) eliminate  | now (at this time)    | (end) result          |
| (continue to) remain    | period (of time)      | (final) outcome       |
| (currently) being       | (private) industry    | (currently) underway  |
| (separate) entities     | (various) differences | each (individual)     |

## 2. Eliminate Writing Zeroes

|                                |                     |
|--------------------------------|---------------------|
| The presence of                | As a matter of fact |
| It should be pointed out that  | I/we might add that |
| It is noteworthy that          | In the course of    |
| It is significant that         | The fact that       |
| It is interesting to note that |                     |

*Expletives* – it + is/was or there + is/are/was/were

## 3. Reduce Sentences to Their Simplest Forms

### 3A. CIRCUMLOCUTIONS:

|                            |             |
|----------------------------|-------------|
| <u>Bulky</u>               | <u>Trim</u> |
| At this point in time      | now         |
| At that point in time      | then        |
| Has the ability to         | can         |
| Has the potential to       | can         |
| In light of the fact that  | because     |
| In the event that          | if          |
| In the vicinity of         | near        |
| Owing/due to the fact that | because     |
| The question as to whether | whether     |
| There is no doubt but that | no doubt    |

### 3B. MORE CIRCUMLOCUTIONS:

|  |                      |
|--|----------------------|
| the reason for<br>for the reason that<br>considering the fact that<br>on the grounds that<br>this is why                 | =because, since, why |
| on the occasion of<br>in a situation in which<br>under circumstances in which  | =when                |
| as regards<br>in reference to<br>with regard to<br>concerning the matter of<br>where _____ is concerned                  | =about               |
| it is crucial that<br>it is necessary that<br>there is a need/necessity for<br>it is important that<br>cannot be avoided | =must, should        |
| is able to<br>has the opportunity to<br>has the capacity for   | =can                 |
| it is possible that<br>there is a chance that<br>it could happen that<br>the possibility exists for                      | =may, might, could   |

### 3C. PREPOSITIONAL PHRASES:

[begin with...] with of, in, at, on, for, through, over..

### 3D. VERB PHRASES:

#### Bulky

are aware of/have knowledge of  
are taking  
are indications/indicative of  
are suggestive of  
can be compared to

#### Trim

know  
take  
indicate  
suggest  
resemble

### 3E. ADJECTIVES & ADVERBS:

Adjectives: Comprehensive, detailed, fundamental, specific, particular, somewhat, kind of, sort of, type of...

Adverbs: Very, really, basically, definitely, actually, practically, generally...

### 3F. NEEDLESSLY COMPLEX WORDS:

| Category             | Example  | Possible Substitute  |
|----------------------|--|--|
| Nouns                | Familiarization<br>Utilization   | Familiarity<br>Use   |
| Verbs                | Facilitate<br>Finalize<br><b>Utilize</b>                                     | Cause<br>Finish/End<br><b>Use</b>                              |
| Adjectives           | Individualized   | Individual   |
| Adverbs/Prepositions | Firstly, secondly, thirdly<br>Heretofore<br>Hitherto<br>Therewith<br>Amongst | First, second, third<br>Previous<br>Until now<br>With<br>Among |

### 3G. NOMINALIZATIONS:

Establishment, measurement, development, collection, discovery, movement, reaction, completion, failure, refusal, discussion, investigation...

## EDITING TIPS FOR CLARITY & CONCISION

**Tip 1:** Dedicate one read-through solely to cutting. No additions allowed.

**Tip 2:** Use the Find/Search feature in Word/Adobe to hunt wordiness down

**Tip 3:** Search and/or circle:

- Redundancies and Zeroes you *know* you're prone to
- Any instance of expletives (it + be or there + be)
- Any preposition beginning a phrase
- Adverbs, especially 'very' and 'really'