

Writing in the Sciences

(T)

-Introduction

-what makes good writing?

takes having something to say and clear thinking

1. good writing communicates an idea clearly and effectively.

2. good writing is elegant and stylistic.

↓
takes time, revision, and a good editor!

-what makes a good writer?

-Inborn talent? ✗

-years of English and humanities classes? ✗

-an artistic nature? ✗

-the influence of alcohol and drugs? ✗

-divine inspiration? ✗

-having something to say. ✓

-logical thinking. ✓

-a few simple, learnable rules of style
(the tools you will learn in this course) ✓

Take-home message: good writing can be learned!

②

- steps to become a better writer:

- a) read, pay attention, and imitate.
- b) write in a journal.
- c) let go of "academic" writing habits (deprogramming step!)
- d) talk about your research before trying to write about it.
- e) write to engage your readers - try not to bore them!
- f) stop writing for "inspiration".
- g) accept that writing is hard for everyone.
- h) revise. nobody gets it perfect on the first try!
- i) learn how to cut ruthlessly - never become too attached to your words.
- j) find a good editor! (Chat GPT!)
- k) Take risks.

- examples of what not to do

- disclaimer:

- ASK yourself:

- is the sentence easy to understand?
- is the sentence enjoyable and interesting to read?
- is the sentence readable?
- is it written to inform or to obscure?

- complex ideas do not require complex language.
- scientific writing should be easy and even enjoyable to read!

- principle of effective writing:

- use of nouns

- note the use of nouns instead of verbs.
[nouns: slow the reader down.
 verbs: more sentences long.]

- note the use of vague words.

- reader can not get a concrete picture in their head of what the author talking about.

- note the use of unnecessary jargon and acronyms.

- note the passive voice:

- note the distance between the subject and the main verb of the sentence.

- principle 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 do not bury the main verb!

cut the clutter

1. Dead weight words and phrases:

a) as it is well known. ✗

b) as it has been shown. ✗

c) it can be regarded that. ✗

d) it should be emphasized that. ✗

2. Empty words and phrases

a) basic tenets of

b) methodologic

c) important

3. long words or phrases that could be short. (5)

a. unnecessary jargon and acronyms

5. repetitive words or phrases

6. Adverbs

very, really, quite, basically, generally, etc.

-long words or phrases that could be short.

wordy version X

A number of

Are of the same opinion

Less frequently occurring

all three of the

give rise to

due to the fact that

have an effect on

crisp version ✓

many

agree

rare

the three

~~because~~

cause

because

affect

-a few other small tricks (cut the clutter)

To Eliminate negatives

2. Eliminate superfluous uses of "there are"

There is ^

3. omit needless prepositions

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-eliminate negatives:

-she was not often right. → she was usually wrong.

-eliminate there are/there is:

-There are many ways in which we can arrange the pallets. → we can arrange the pallets in many ways.

- omit needless prepositions

the meeting happened on monday.

↓

the meeting happened monday.

they agreed that it was true.

↓

they agreed it was true.

-use the active voice-

Passive

By applying a high resolution, 90 degree bending magnet downstream of the laser electron interaction regions, the spectrum of the electron beams could be observed.

active

we could observe the spectrum of the electron beams by applying a high resolution, 90 degree bending magnet downstream of the laser electron interaction region-

Passive

The activation of Catt channels is induced by the deflection of endoplasmic reticulum Catt stores

active

Depleting Catt from the endoplasmic reticulum activates Catt channels.

Advantages of the active voice

1. Emphasizes author responsibility.
2. improves readability.
3. reduces ambiguity.

- it is ok sometimes use passive voice.

for example, passive voice may be appropriate in the methods section where what was done is more important than who did it.

- is it really ok to use "we" and "I":

Yes, it is ok!

reasons:

1. the active voice is livelier and easier to read.

2. Avoiding personal pronouns does not make your science more objective.

3. By agreeing to be an author on the paper, you are taking responsibility for its content. thus, you should also claim responsibility for the assertions in the text by using "we" or "I".

- write with verbs:

- use strong verbs.

- avoid turning verbs into nouns.

- do not bury the main verbs.

use strong verbs.

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"Loud music came from speakers embedded in the walls, and the entire arena moved as the hungry crowd got to its feet." ✓

"Loud music exploded from speakers embedded in the walls, and the entire arena shook as the hungry crowd leaped to its feet." X

do not turn verbs into nouns.

obtain estimates of → estimate.

has seen an expansion in → has expanded.

provides a methodologic → emphasizes methodologic emphasis

Take an assessment of → assess.

do not bury the main verb:

Keep the subject and main verb close together at the start of the sentence...
readers are waiting for the verbs

Experiment with punctuation:

(10)

original:

Many types of cells and tissues develop a kind of directionality. Certain events happen toward one end of the cell or tissue or the other. It's a phenomenon called cell polarity.

using a colon

Many cells and tissues develop a kind of directionality called cell polarity. Certain events happen toward one end of the cell or tissue.

- Increasing Power of Separation

- Comma

- Colon: bigger pause than comma

- Dash

- Parentheses: extra information

less formal
than the
dots.

- Semicolon: separate two related sentences

- Period: denotes a complete stop.



- Semicolon, connect two independent clauses.

(11)

a clause always
contains a subject
and predicate

exp: It was the best of times;
it was the worst of times.

Separate items in a list with semicolon (items which contain internal Punctuations)

exp: It happened because people organized and voted for better prospects; because leaders ~~enacted~~ enacted smart, forward-looking policies; because people's perspectives opened up, and with them, societies did too.

- parenthesis: use parenthesis to insert an afterthought or explanation (a word, phrase, or sentence) into a passage that is grammatically complete without it.

- if you remove the material within the parenthesis, the main point of the sentence should not change
- Parenthesis give the reader permission to skip the material.

exp: They also have a specialized tail, kind of like a monkey's tail, that allows them to cling to a piece of grass (or a lucky diver's finger).

Colon: use a colon after an independent clause to introduce a list, quote, explanation, conclusion, or amplification.

-The colon has more effect than the comma, less power to separate than the semicolon, and more formality than dash.

exp: The hydrogen bonds are made as follows:
Purine position 1 to Pyrimidine position 1; Purine position 6 to Pyrimidine position 6.

Note the "rule of three's" for lists and examples. ~~should~~ use three examples.

Dash: use the dash to add emphasis or to insert an abrupt definition or description almost anywhere in the sentence. just donot overuse it, or it loses its impact.

- a dash is a mark of separation stronger than a comma, less formal than a colon, and more relaxed than parenthesis.

-use a dash only when a more common mark of punctuation seems inadequate.

exp: The drugs did more than prevent new fat accumulation. They also triggered overweight mice to shed significant amounts of fat — up to half their body weight. (emphasis) (13)

Parallelism:

Pairs of ideas ~~should~~ joined by "and", "or", or "but" should be written in parallel form.

exp:

the velocity decreased by 50%. but

the pressure decreased by only 10%.

we aimed to increase the resolution

and

to improve picture quality. } infinity sentences.

lists of ideas should be also written in parallel form.

~~exp~~

exp)

unparallels:

Locusts denuded fields in Utah, ratal Iowa was washed away by torrents, and in Arizona the cotton was shriveled by the blazing heat.

parallels:

Locusts denuded fields in Utah, torrents washed away ratal Iowa and blazing heat shriveled Arizona's cotton.

Paragraphs:

- 1 paragraph = 1 idea.
- give away the punch line early. (write the conclusion first and then the details.)
- Paragraph flow is helped by:
 - logical flow of ideas
 - parallel sentence structures
 - if necessary, transition words.
- your reader remembers the first sentence and the

last sentence best. make the last sentence memorable. Emphasis that ~~is~~ at the End!

-logical flow of ideas:

- sequential in time (avoid the Memento approach!)
- general → specific (take-home message first)
- Logical arguments (if a then b; a; therefore b)

A note on repetitions:

-when you find yourself reaching for the thesaurus to avoid using a word twice within the same sentence or even paragraph, ask:

- 1) Is the second instance of the word even necessary?
- 2) If the word is needed, is a synonym really better than just repeating the word?

repeat key words:

e.g. names of comparison groups,
variables, or instruments.

Overview of the writing process:

1) Prewriting:

1. To
- collect, synthesize, and organize information.
 - Brainstorm take-home messages.
 - work out ideas away from the computer.
 - develop a road map/outline.

2) Writing the first draft

2. To
- putting your facts and ideas together in organized prose.

3) Revision:

3. To
- read your work out loud.
 - Get rid of clutter.
 - Do a verb check.
 - Get feedback from others.

1) Prewriting tips:

Get organized first

- do not try to write and gather information simultaneously
- gather and organize information before writing the first draft.
- :

2) Tips for writing the first draft:

- Do not be a perfectionist!
- The goal of the first draft is to get the ideas down in complete sentences in order.
- focus on logical organization more than sentence-level details.
- writing the first draft is the hardest step for most people. minimize the pain by writing the first draft quickly and efficiently!

3) Revision

- read your writing out loud
 - The brain processes the spoken word differently than the written word!
- Do a verb check
 - underline the main verb in each sentence
- Don't be afraid to cut!
 - ~~watch for~~
 - dead weight words and phrases
 - empty words and phrases
 - long words or phrases that could be short.

- Do an organizational review

- in the margins of your paper, tag each paragraph with a phrase or sentence that sums up the main point.
- then move paragraphs around to improve logical flow and bring similar ideas together

- checklist for final draft:

- check for consistency.
- check for numerical consistency.
- check your references.

- check for consistency

exps

"we followed participants for a minimum of 2 years" (methods section)

"the average follow-up time was 2.5 years" (results section)

- check your references:

- do you have references to nowhere?
- references does not provide the indicated information / fact.
 - Authors misinterpreted or exaggerated the findings from the original source.
 - references cites a secondary source rather than a primary source. (citation propagation)
 - authors mis-numbered the references.

- Take home message)
- Always cite/go back to primary sources!
- Assume that other authors have made errors in citing sources!
- Recommended order for writing an original manuscript,

1. Tables and Figures

2. Results

3. Methods

4. Introduction

5. Discussion

6. Abstract

- tables and figures are the foundation of your story!
- editors, reviewers, and readers may look first (and maybe only) at title, abstracts, and tables and figures.
- figures and tables should stand alone and tell a complete story. The reader should not need to refer back to the main text.

-use the fewest figures and tables needed to tell the story.

-do not present the same data in both a figure and a table.

- Result Section

Results ~~of~~ from data

-The results section should:

- summarize what the data show
 - point out simple relationships
 - describe big-picture trends
 - cite figures or tables that present supporting data
- avoid simply repeating the numbers that are already available in tables and figures.

-tips for writing results:

- break into subsections, with headings (if needed)
 - complement the information that is already in tables and figures.
 - give precise values that are not available in the figure.

- report the percent change or percent difference if absolute values are given in the table.
- repeat/highlight only the most important numbers.
- do not forget to talk about negative and control results.
- reserve the term "significant" for statistically significant.
- reserve information about what you did for the methods section.
 - in particular, do not discuss the rationale for statistical analysis within the results section.
 - reserve comments on the meaning of your results for the discussion section.
- methods and materials:
 - give a clear overview of what was done.
 - give enough information to ~~re~~ replicate the study (like a recipe!)
 - Be complete, but make life easier for your reader! (reduce ~~the~~ complexity)

1. Break into smaller sections with subheadings. (2)

2. cite a reference for ~~most~~ commonly used methods.

3. Display in a flow diagram or table where possible.

- You may use jargon and the passive voice more liberally in the methods section.

Introduction

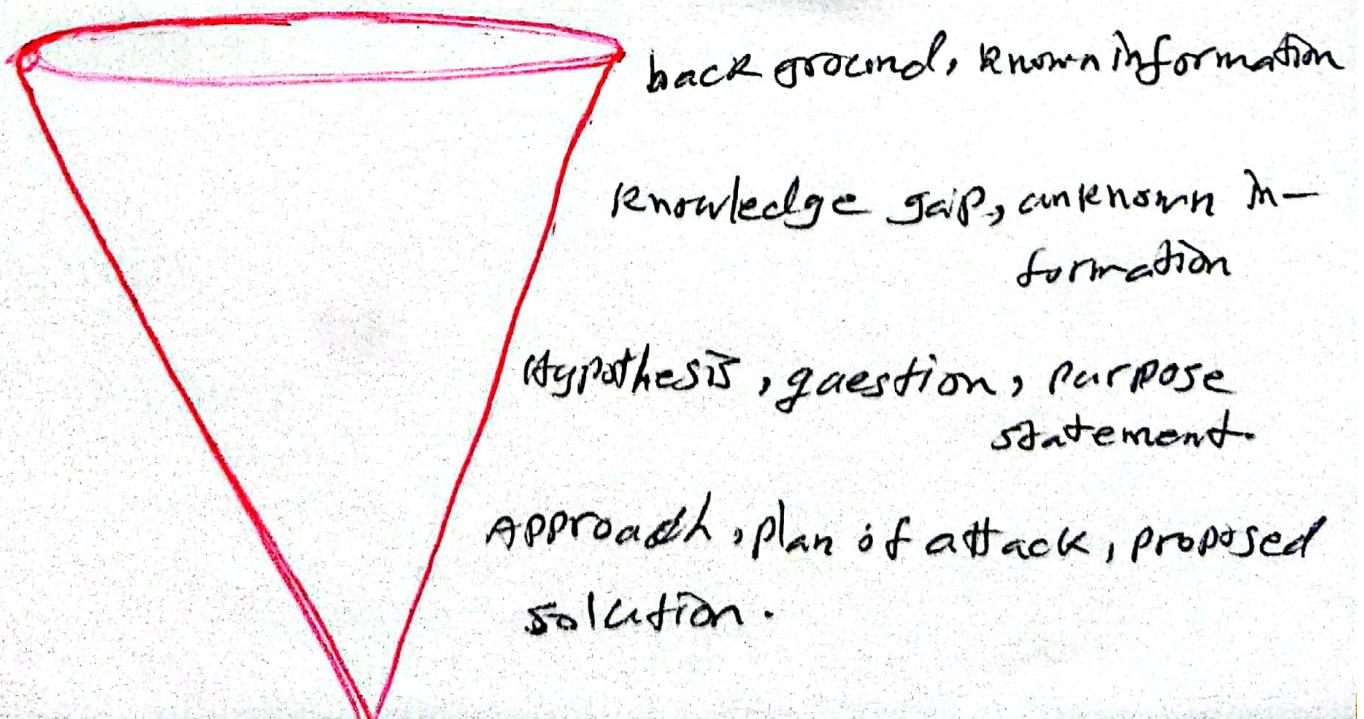
- follows a fairly standard format.

- Typically 3 Paragraphs long

- recommended range: (2-5)

- it's not an exhaustive review of your general topic.

- should focus on the specific hypothesis/aim of your study.



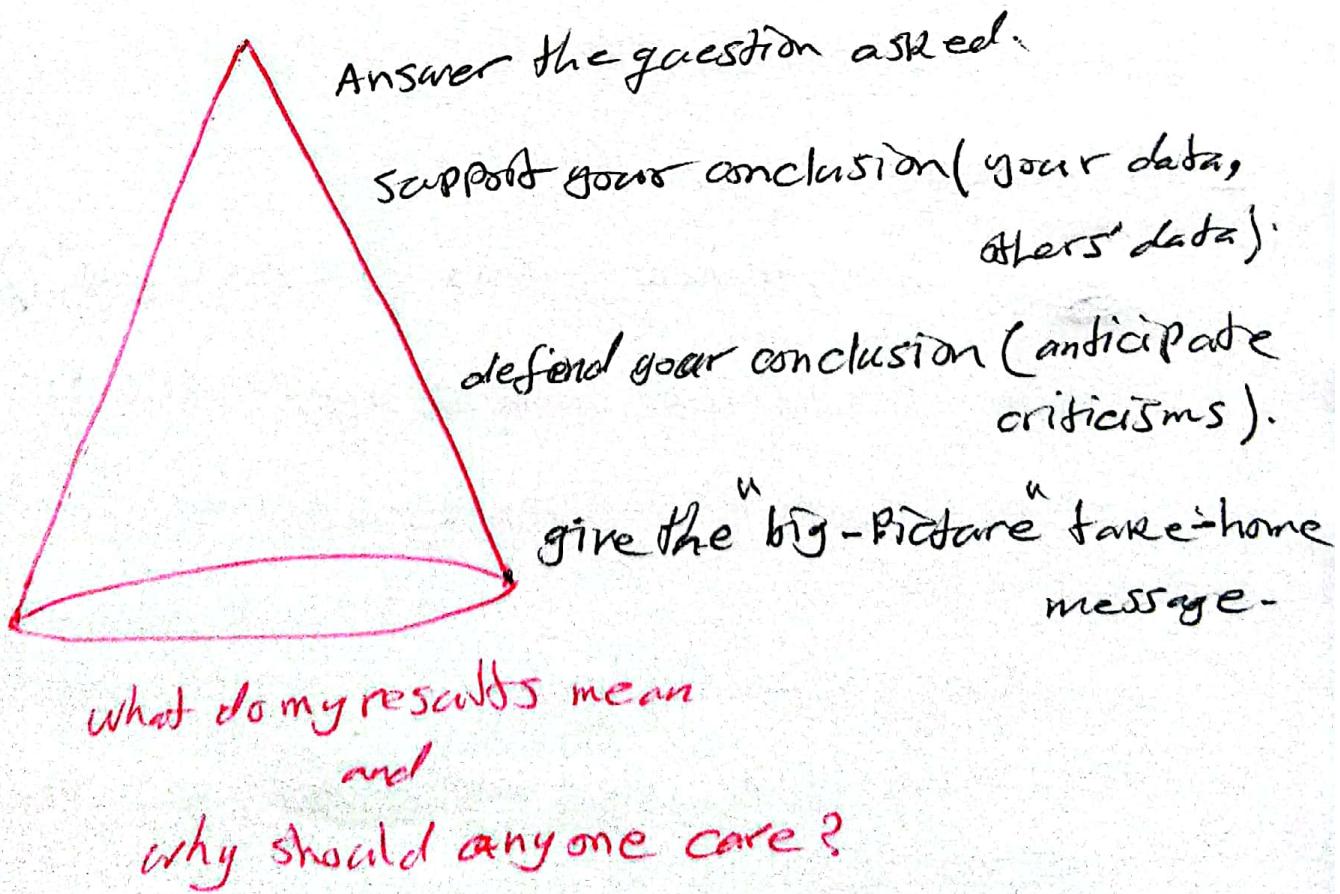
Introduction

1. what's known [Paragraph 1]
 2. what's unknown [Paragraph 2]
 - limitations and gaps in previous studies.
 3. Your burning question/hypothesis /aim?
 4. Your experimental approach (briefly)
 5. why your experimental approach is new and different and important (fills in the gaps)
- } Paragraph 3

Tips for introduction

- Keep paragraphs short.
- write for a general audience.
- - clear, concise, non-technical
- take the reader step by step from what is known to what is unknown. End with your specific question.
 - Known → unknown → question/hypothesis.
- Emphasize how your study fills in the gaps (the unknown)
 - Explicitly state your research question/aim/hypothesis.
 - we asked whether ...
 - our aim/s were ...
 - our hypothesis was ...
 - we tested the hypothesis that ...

- Do not answer the research question (no results or implications).
- Summarize at a high level! Leave detailed descriptions, speculations, and criticisms of particular studies for the discussion.
- Discussion section:
 - gives you the most freedom.
 - gives you the most chance to put good writing on display.
 - It is most challenging to write.



TIPS (Discussion)

(25)

- showcase good writing!
 - use the active voice.
 - Tell it like a story.
- start and end with main finding.
 - "we found that in"
- Do not travel too far from your data.
 - focus on what your data do prove, not what you had hoped your data would prove.
- focus on the limitations that matter, not generic limitations.
 - make sure your take-home message is clear and consistent.
- Abstract:
 - (~~ab~~ = out, trahere = pull, "to pull out")
 - overview of the main story.
 - gives highlights from each section of the paper.
 - limited length (100 - 300 words, typically)
 - stands on its own.
 - most often, the only part people read.

Abstract

1. Background

2. Question/aim/hypothesis

3. experiment(s)

- quick summary of key materials and methods.

4. Results

- key results found

- minimal raw data

5. Conclusion, the answer to the question asked/take-home message.

6. ~~for~~ Implication, speculation, or recommendation

 important
 wrong

Plagiarism

- passing off other people's writing (or tables and ~~charts~~ figures) as your own.

- cutting and pasting sentences or even phrases from another source.

- slightly rewriting or re-arranging other's words

"borrowing" material from sites like
Wikipedia

ex)

original version (Wikipedia): Ernest Miller Hemingway (July 21, 1899 – July 2, 1961) was an American author and journalist. His economical and understated style had a strong influence on 20th-century fiction, while his life of adventure and his public image influenced later generations.

Plagiarized Version: Ernest Hemingway's rhythmic and understated style strongly influenced 20th-century fiction. His audacious lifestyle and public image also influenced later generations.

Self-Plagiarism and Duplication

- recycling your own writing or data, including:
 - copying or only slightly rewording text from your own previously published papers

- adding new data to already published data and presenting it as new results.
- submitting identical or overlapping data to multiple journals

Authorship

1. who gets authorship?

- any author listed on the paper's title page should take public responsibility for its content.

2. in what order?

- order implies authors' relative contributions
(with exception of the senior author position)

- the senior author (head of the lab or research team) often appears as the last-listed author

Acknowledgments

- funding sources.

- contributors who did not get authorship (e.g., offered materials, advice, or consultation that was not significant enough to merit authorship).

The submission process

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1. Identify a journal for submission (Identify before writing!)
2. Follow the online "instructions for authors" for writing and formatting the manuscript.
3. Submit your manuscript online (corresponding author)
 - all authors must fill out and sign copyright transfer and conflict of interest forms (often done offline)
4. Possible outcomes: accepted; accepted pending minor revisions; rejected but ~~re-submission possible~~; no resubmission possible.
5. Revision and resubmissions: re-submit with cover letter that addresses reviewers critiques point by point.
6. Once accepted, carefully review final proofs!

Peer review

(an methodology example)

1. Scan the abstract

2. jump to the data; review the tables and figures first

- draw your own conclusion.

- do the tables and figures stand on their own?

- are there any obvious statistical errors?

- Is there repetitive information?

3. read the paper once through

- do the author's conclusions match their data?

- Is the paper clearly written, or did you struggle to get through it? If you should not have to struggle!

- Is the length of the paper justified given the amount of new information that the data provide?

to read the introduction carefully.

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5. Read the methods carefully.

6. Reads the results carefully.

7. Look at each table and figure.

8. Read the discussion carefully.

Predatory journals ?!

"writing a review article"

Goals:

- Synthesize and evaluate the recent primary literature on a topic.
- Summarize the current state of knowledge on a topic.
- Address controversies.
- Provide a comprehensive list of citations.

Types of reviews:

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1. non-systematic review (narrative)^{review}
2. systematic review.
3. meta-analysis.

-Systematic reviews:

- Attempts to find and summarize all relevant studies. May even include unpublished work.
- Follows a rigorous search strategy using pre-defined exclusion and inclusion criteria. searches multiple databases.
- evaluates the quality of each study using rigorous, pre-defined criteria. (often quantitative).

-non-systematic reviews:

- sometimes called a "narrative" review.
- may not be comprehensive.
- qualitative review.

- meta-analysis:

- a systematic review that additionally uses statistical techniques to pool data from independent studies (sometimes including unpublished studies.)

TIPS for review Articles

- Start with a more broad search, and then narrow it.
- clearly define your thesis or theme.
- invest time getting organized!

{ - take notes from each paper during reading.
(organize the notes by addressing them:
- section, subsection, article
~~page~~ app(s) end note, mandaly

- divide the review into sections with separate headings.
- consider putting information in tables, figures, and/or sidebars.
- write for a broad audience

review articles / struktur:

- Abstract
- Introduction
 - clearly state the aim of the review.
- the body of the paper.
 - divide into sections.
 - summarize the literature, organized based on methodology or theme.
 - analyze, interpret, critique, and synthesize studies.

~~conclusion~~
Conclusion

- what recommendations can you make?
- what gaps remain in the literature? what future studies could help fill in these gaps?
- literature cited.

Grants

- why submit a research proposal?

clarifies and deepens your thinking.

- increases productivity and impact.

- critical in all career paths.

- Securing funding is an accomplishment and has positive career benefits.

recommendation letters !!!

TIPS for recommendees

- approach potential letter writers at least several weeks in advance of the deadline.

- choose your recommenders carefully.

- take "no" for an answer.

- avoid recommenders who ask you to draft your own letter.

- make life easy for your letter writer.

- provide them with your CV; offer to meet with them; give them clear and easy instructions on how to submit the letter; provide a link to information about the position or award.

Personal

- writing ~~personal~~ statements

- make it personal
 - speak from the heart.
 - reveal who you are.
 - strike for flair, not "blah"
 -
- give specific examples and stories
 - show, do not tell.
 - Do not read your CV line by line.
 - highlight relevant experiences.
- avoid big words you don't understand and avoid clichés.
- show interest in/flatter your readers
 - do your homework.
 - be specific about why the specific program/institution/award appeals to you.
- Explain ~~gaps~~ gaps and failures
 - do not ignore these in hopes that reviewers ~~won't~~ notice the issue!