

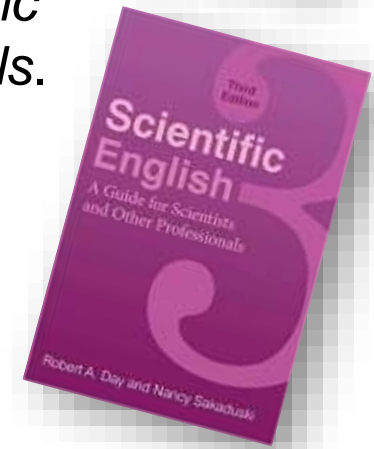
Process of Effective Writing

ENGR 361: Scientific Research Communication

<https://www.csulb.edu>

References

- Alred, G. J., Brusaw, C. T., & Oliu, W. E. (2009). *Handbook of technical writing*. Macmillan.
- Day, R. A., Sakaduski, N., & Day, N. (2011). *Scientific English: A guide for scientists and other professionals*. ABC-CLIO.



Language & Writing Important in Science

- RB Woodward was a Chemistry Nobel Laureate
 - He is considered by some to be one of the greatest chemists of all time



Woodward's Words: Elegant and Commanding

*Jeffrey I. Seeman**

900 Cherryvale Road
Boulder, Colorado
October 23, 1961

Dear Mr. Woodward,

A question has been bothering me and I was wondering if you could answer it for me.

I am a sophomore at Fairview High School and I have been studying English since about the third grade. I plan to become a chemist such as you are and I wondered why I have to take so much English. Is English that important in the field of chemistry? It seems as though I would be better off taking subjects that would have closer relationships to chemistry. I would appreciate your opinions about English and its usefulness, if any, in chemistry. Also, what courses do you recommend that I try to take in high school and in college.

Thank you very much for your time and consideration.

Sincerely yours,
Allen Hoos

Clauses

- Independent Clauses

- A group of words that contains a subject and a verb and expresses a complete thought
- An independent clause is a sentence
 - *Mike studied in the bar for his physical chemistry test.*

Clauses

- Dependent Clause

- A group of words that contains a subject and a verb but does NOT express a complete thought
- Usually signaled by a “dependent clause marker”
 - When Mike studied in the bar for his physical chemistry test....

Dependent Clause Markers					
after	as if	even if	in order to	unless	when
although	because	even though	since	until	whenever
as	before	if	though	whatever	while

Connecting Clauses

- Coordinating Conjunctions
 - 7 coordinating conjunctions used at the beginning of an independent clause
 - **and, but, for, or, nor, so, yet**
 - *Mike studied in the bar for his physical chemistry test, **but** he had a hard time concentrating because of the noise.*

Connecting Clauses

- *Mike studied in the bar for his physical chemistry test, **but** he had a hard time concentrating because of the noise.*
 - 2 independent clauses joined by ‘**but**’
 - A comma is needed to separate the clauses, positioned immediately before the conjunction

Connecting Clauses

- Independent Marker Word
 - Common independent marker words
 - **also, consequently, furthermore, however, nevertheless, therefore**
 - *Mike studied in the bar for his physical chemistry test; **however**, he had hard time concentrating because of the noise.*

Connecting Clauses

- *Mike studied in the bar for his physical chemistry test; **however**, he had a hard time concentrating because of the noise.*
 - 2 independent clauses joined by '**however**'
 - A semi-colon is needed to separate the clauses
 - Positioned at the end of the first
 - A comma follows the independent marker word

Common Errors

- Comma Splices

- Separating 2 independent clauses with only a comma

Incorrect: ■ *I isolated the enzyme, it was inactive.*

- Rewrite this in 3 to 4 ways that correctly connects these two independent clauses

Common Errors

- Comma Splices

- Separating 2 independent clauses with only a comma

Incorrect:

- *I isolated the enzyme, it was inactive.*

- *I isolated the enzyme. It was inactive.*

- *I isolated the enzyme; it was inactive.*

Correct:

- *I isolated the enzyme; however, it was inactive.*

- *I isolated the enzyme, and it was inactive.*

- *I isolated the enzyme, but it was inactive.*

Common Errors

- Fused Sentences (run-on sentences)
 - Two independent clauses with no separating punctuation

Incorrect: ■ *I ordered hot coffee I burned my tongue.*

- Rewrite this in 3 to 4 ways that correctly connects these two independent clauses

Common Errors

- Fused Sentences (run-on sentences)
 - Two independent clauses with no separating punctuation

Incorrect:

■ *I ordered hot coffee I burned my tongue.*

■ *I ordered hot coffee. I burned my tongue.*

■ *I ordered hot coffee; I burned my tongue.*

Correct:

■ *I ordered hot coffee, and I burned my tongue.*

■ *I ordered hot coffee; consequently, I burned my tongue.*

Common Errors

- Sentence Fragments
 - When a dependent clause or other incomplete thought is treated as a complete sentence
 - Two methods to address a sentence fragment
 - Combine sentence fragment with another sentence to make it a complete thought
 - Remove the dependent marker from the fragment

Common Errors

- Sentence Fragments

- When a dependent clause or other incomplete thought is treated as a complete sentence

Incorrect: ■ *Because I failed to include a negative control.*

- Rewrite to correct this sentence fragment

Using Commas ,



"I have trouble with punctuation. I just don't have any comma sense."

Using Commas ,

- Use a comma after an introductory phrase, prepositional phrase, or dependent clause
 - *To get a good grade, you must complete all the assignments.*
 - *After Phil's funeral, we all met at a diner to chat.*
- Example?

Using Commas ,

- Use a comma to separate elements in a series
 - *Both candidates for president promised, if elected, to increase jobs, reform education, increase spending for the poor, and stop calling the other an idiot in their attack ads.*
- Example?

Using Commas ,

- Use a comma to separate non-essential elements from a sentence
 - *Emma's car, a red Honda, needs new headlights.*
- Omitting the non-essential element does not change the meaning of the independent clause
- Example?

Using Commas ,

- Use a comma between coordinate adjectives (adjectives that are equal and reversible)
 - *The thrilled, excited fans waited impatiently for the game to start.*

- Example?



(source: owl.english.purdue.edu)

Using Commas ,

- Use a comma with quoted words
 - *Regarding chocolate, Dave Barry wrote, "Your hand and your mouth agreed many years ago that, as far as chocolate is concerned, there is no need to involve your brain."*

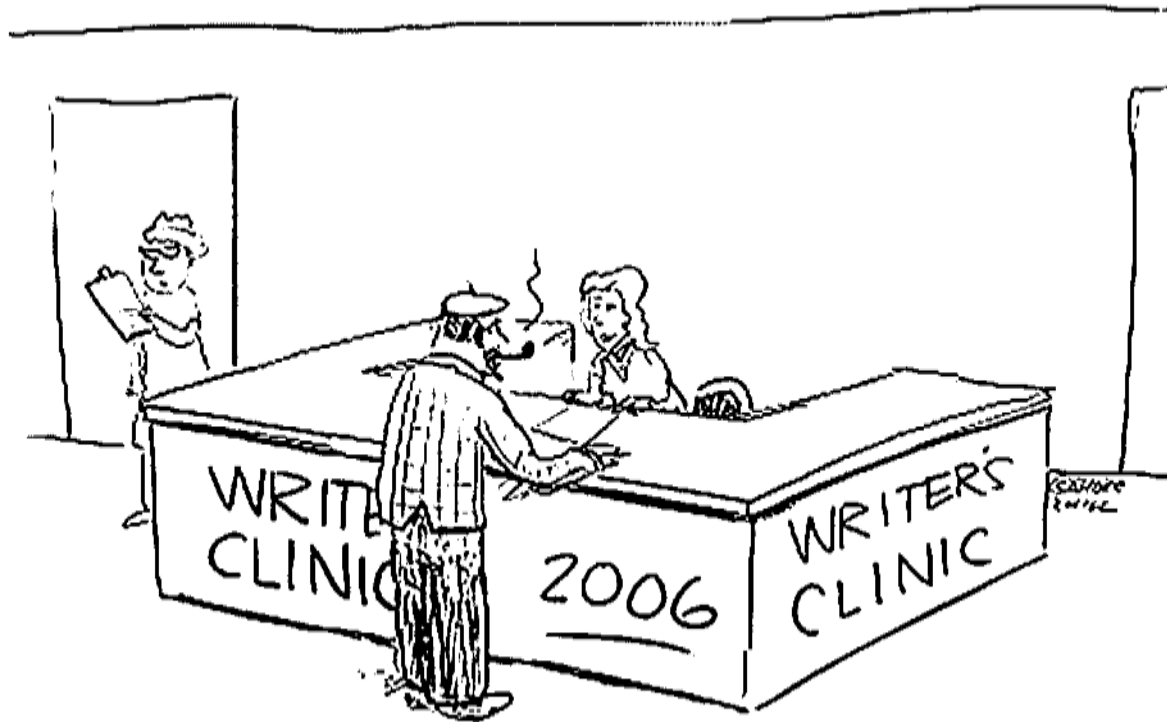
Using Commas ,

- Use a comma with a date
 - *November 1, 2015*
 - *Monday, November 1, 2015*
 - *Monday, 1 November 2015*
- Use a comma in a personal title
 - *John Smith, M.D.*



Michael Scott, Chief Executive Officer

Using Semicolons ;



I'M HERE FOR A SEMI-COLONOSCOPY.

(source: owl.english.purdue.edu)

Using Semicolons ;

- Use a semicolon to join 2 independent clauses when...
 - ...the second clause restates the first
 - ...the 2 clauses are of equal emphasis
 - ...the 2nd clause begins with an independent marker word

Using Semicolons ;

- ...the second clause restates the first
 - *Setting up the new facility made it hard to move freely in the lab; the floor space was littered with open boxes and packing materials.*

- ...the 2 clauses are of equal emphasis
 - *The 300 MHz NMR has been in chronic disrepair; in fact, the unit has been inoperable for four of the last six months.*

Using Semicolons ;

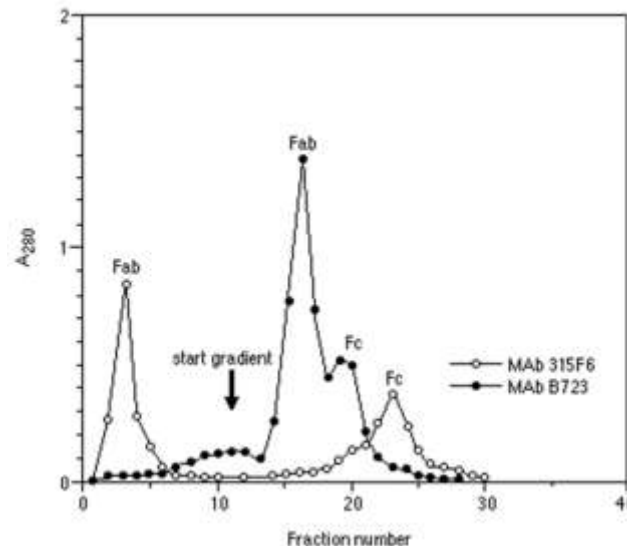
- ...the 2nd clause begins with an independent marker word
 - *Mike studied in the bar for his physical chemistry test; **however**, it was hard to concentrate because of the noise.*

Using Semicolons ;

- Use a semicolon to join elements of a series when individual items of the series already include commas
 - *Possible dates for the student research symposium included December 15, 2015; April 6, 2016; and August 18, 2016.*
 - Example??
- Note: Use semicolons only when necessary. Chronic use can create long sentences whose meaning may be obscure

Using Colons :

- Use a colon to join two independent clauses when you want to emphasize the second clause.
 - *The ion-exchange column worked well during the purification: the Fab and Fc fragments of monoclonal antibody 315F6 were separated completely.*



(source: owl.english.purdue.edu)

Using Colons :

- Use a colon after an independent clause when it is followed by a list, a quotation, or other idea directly related to the independent clause
 - *Former U.S. Vice-president Dan Quayle shared his opinion about pollution: “It isn’t pollution that is hurting the environment; it’s the impurities in our air and water that are doing it.”*
 - *The homogenization buffer contained the following components: 400 mM KCl, 1 mM EGTA, 1% Triton X-100, and 10 mM Tris, pH 8.0.*
 - Example?

Using Colons :

- Use a colon after the greeting in a business letter
 - *To Whom It May Concern:*
- Use a colon to separate the hour and minutes in time
 - *The class started Tuesdays and Thursdays at 9:30 AM.*



(source: owl.english.purdue.edu)

Punctuation Shifts Emphasis

- What's your impression of these 3 statements?
- How does the emphasis of the statements differ?
 - *“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.”*

Punctuation Shifts Emphasis

- What's your impression of these 3 statements?
- How does the emphasis of the statements differ?
 - *“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).”*

Punctuation Shifts Emphasis

- What's your impression of these 3 statements?
- How does the emphasis of the statements differ?
 - *“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.”*

Parentheses ()

- Use parentheses to insert a word, clause, or sentence into a passage as an explanation or an afterthought
 - The sentence with the parenthetical expression is grammatically complete without the insertion
 - Removing the insert does NOT change the main point of the sentence
 - *Jane Austen (16 December 1775 – 18 July 1817) was an English author whose six novels set among the gentry earned her a place as one of the most popular writers in English literature.*

Dashes –

- Use dashes to set off an abrupt break or interruption or to announce a long explanation or summary
 - Dashes add emphasis to the offset word or phrase
 - *Everything I saw in my new neighborhood—from the graceful elm trees to the stately brick buildings—reminded me of my alma mater.*
 - Example?

Dashes –

- Use a dash to set off an appositive phrase that already includes commas
 - An appositive is a word that adds explanatory or clarifying information to the noun that precedes it
 - *The stock room personnel—Bertha, Ray, and Cynthia—became very popular with certain English majors.*

Ranking Separate Punctuation

■ Increasing power to separate



- comma
- colon
- dash
- parentheses
- semicolon
- period

■ Increasing formality



- dash
- parentheses
- the others (comma, colon, semicolon, period)

Use of Hyphens

- Use a hyphen when joining together 2 or more words serving as a single adjective before a noun
 - *three-way light bulb*
 - *award-winning scientist*
 - *protein-rich fraction*
- When compound-modifiers come **after** the noun, they are not hyphenated
 - *The scientist was well known.*
 - *The fraction was protein rich.*

Use of Hyphens

- Use a hyphen with compound numbers
 - *The professor was thirty-six years old.*
 - *ninety-two, twenty-eight, thirty-six (hike!)*
- Use a hyphen to avoid confusion or awkward combinations of letters
 - *re-sign a petition (vs resign)*
 - *semi-independent (avoids 'semiindependent')*
 - *shell-like (avoids 'shelllike')*

Use of Hyphens

- Use a hyphen with the prefixes ex-, self-, all-; with the suffix -elect; and between a prefix and capitalized word
 - *ex-husband*
 - *self-assured*
 - *mid-September*
 - *all-inclusive*
 - *mayor-elect*
 - *anti-American*
 - *T-shirt*
 - *pre-Civil War*
 - *mid-1980s*

Parallel Sentence Structure

- Parallel structure
 - Using same pattern of words to show that two or more ideas have the same level of importance
 - Happens at the word, phrase, or clause level
 - Parallel structures usually joined with coordinating conjunctions "and" or "or"
- As a rule, parallel sentence structure is easier to read than non-parallel structure

Parallel Sentence Structure

- Is this an example of Parallel Structure?
 - *Sylvia likes to hike, bike, and go swimming.*
 - **Rewrite using parallel construction**

- Parallel Structure:
 - *Sylvia likes to hike, bike, and swim.* (Infinitive form)
 - *Sylvia likes hiking, biking, and swimming.* (Gerund form)

Parallel Sentence Structure

- Is this an example of Parallel Structure?

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

- **Rewrite using parallel construction**

- Parallel Structure

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

Parallel Sentence Structure

- Is this an example of Parallel Structure?
 - *If you want to be a good scientist, you must study hard, critically think about the scientific literature, and you should be a good listener.*
 - **Rewrite using parallel construction**
 - *If you want to be a good scientist, you must **study hard**, **listen well**, and **think critically** about the scientific literature. (*imperative, imperative, imperative*)*
 - *If you want to be a good scientist, you must be **a good student**, **a good listener**, and **a critical thinker** about the scientific literature. (*noun, noun, noun*)*

Common Word Confusions

- Farther vs Further
- Affect vs Effect
- There vs They're vs Their
 - There are more . . .
- Be careful!!

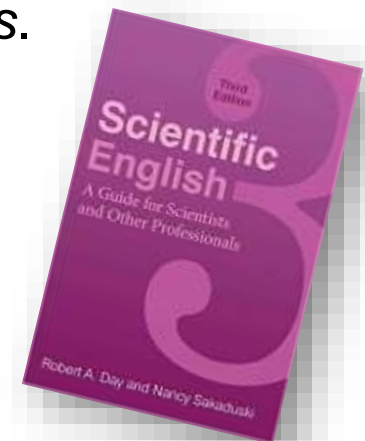
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Steps for Successful Writing

- **Preparation**

- Purpose, Audience, Context, Scope, medium

- **Research**

- Brainstorm, background, patents, sources

- **Organization**

- Outline, logic, method of development

- **Writing**

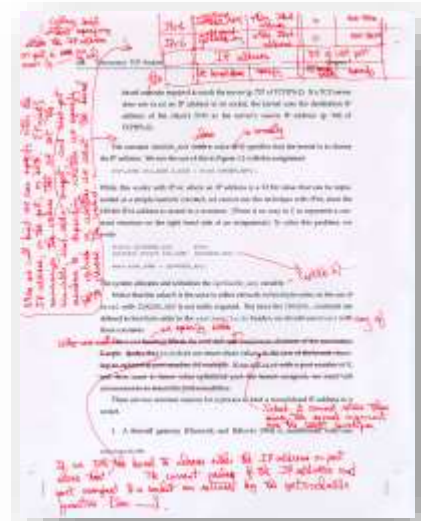
- Style, tone, sentence construction

- **Revision**

- Unity and coherence, conciseness, pace, transition

Steps for Successful Writing

- THINK about the composition
- PLAN your composition
- WRITE your composition
- EDIT and rewrite the composition



Steps for Successful Writing

■ THINKING

- When is your deadline?
- Knowing when you must finish will influence all aspects of the writing process
- Establish a timetable for getting things done
- Work backward from the due date
- Allow time for revisions



“Good writing is bad writing that was rewritten.”
(Marc Raibert, former MIT professor)

Steps for Successful Writing

- **PLANNING** (NIH Grant Proposal Timeline)

- **NIH Deadline: July 1st**

- Final Foundational Review: June 23rd
 - Dean's Review: June 15th
 - Final Revisions (~2 weeks)
 - Colleague(s) Review: May 1st
 - Complete Budget for College Review: April 15th

- Preparation of good working draft (literature search and analysis, compilation of preliminary studies, development of specific aims, development of research plan, background and significance—at least 3 months)

Steps for Successful Writing

■ PLANNING

- Collecting Ideas and Information
 - Plan what you want to say
 - Do not devote too much or too little space on specific elements of the composition
- Think about the reader's questions:
 - *What, why, when?*
 - *How, where, who?*



*Answer
these
questions*



Steps for Successful Writing

- **PLANNING**

- Collecting Ideas and Information

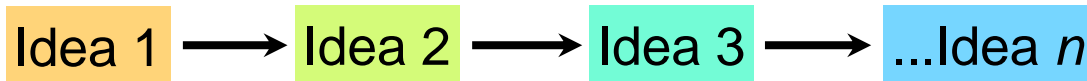
- Provide topics and content for paragraphs in the composition
 - Reader wants relevant information, clearly presented, well organized, sufficiently explained

Steps for Successful Writing

■ PLANNING

- Paragraphs and Progression of Ideas
 - Title helps define purpose and scope of composition
 - Paragraph Organization

Introduction



smooth flow of ideas



Conclusion

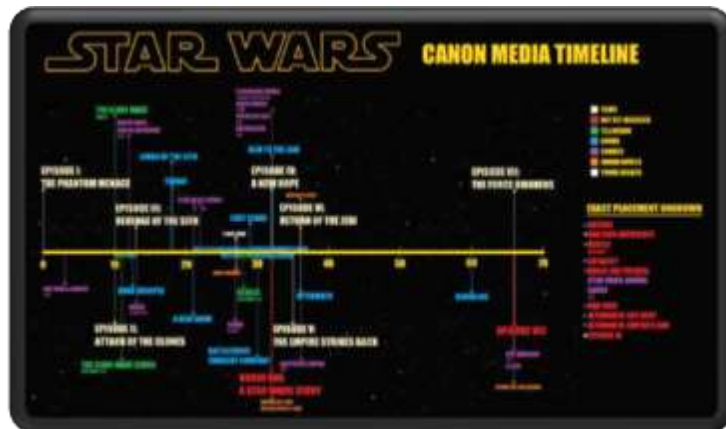
Steps for Successful Writing

■ PLANNING

– Paragraphs and Progression of Ideas

■ Paragraph Sequence

- Ideas in order of increasing importance (or reverse)
- Chronological order (e.g., describing series of analyses)
- Coherent telling of “story”
- Order dictated by external guidelines or template



Steps for Successful Writing

■ PLANNING

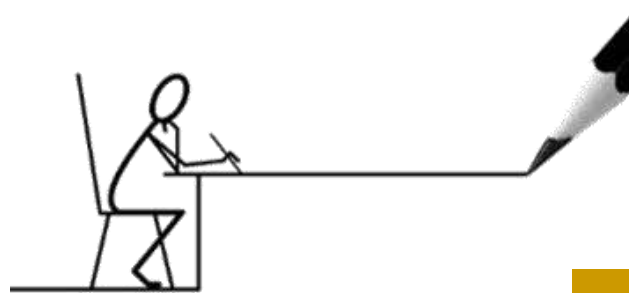
— Prepare a Topic Outline

- Organization of key words, phrases, essential ideas
- The better the outline, the better (and easier) the writing!

**Main focus:
identify, organize
key ideas**



**At this stage, focus
should NOT be on
writing mechanics**

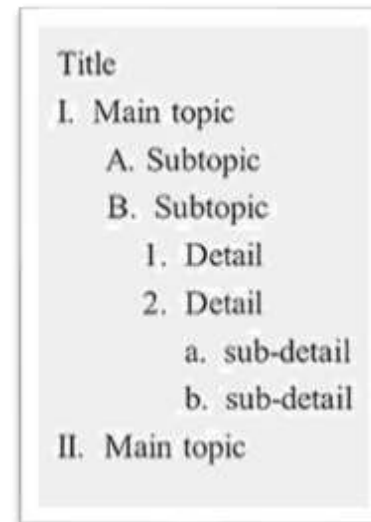
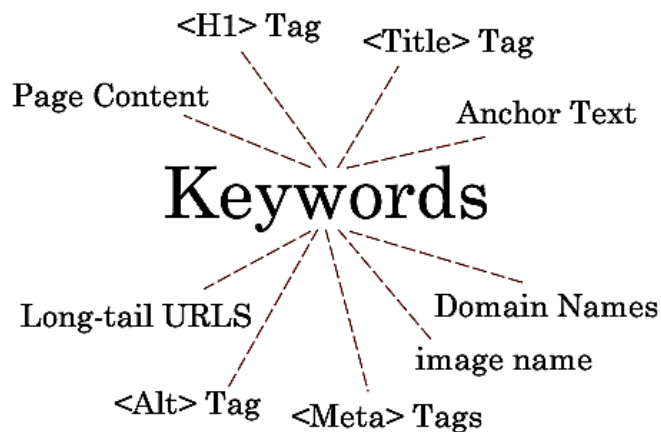


Steps for Successful Writing

■ PLANNING

— Prepare a Topic Outline

- Key words, phrases, sentences become main points of paragraphs
- MODIFYING an Outline is **EASIER** than MODIFYING a Draft



Steps for Successful Writing

■ **PLANNING**

— Questions to Address

- What is the purpose and scope of the composition?
- How should the subject be introduced?
- What is the topic for each paragraph after introduction?
- What ideas must be included in each paragraph?
- What tables or graphics should be included?

Steps for Successful Writing

■ **PLANNING**

— Questions to Address

- What needs the most emphasis?
- What can be omitted?
- What is the most effective arrangement of ideas (of paragraphs)?
- How should the composition be ended?
- What sub-headings would help the reader?

Steps for Successful Writing

■ WRITING

— Paragraph Content

- Capture reader's interest!
- State scope and purpose of composition



Steps for Successful Writing

■ **WRITING**

— Paragraph Content

- Devote one paragraph to a topic
- Each paragraph should be relevant
- State topic of the paragraph in the first or second sentence
- All sentences in the paragraph should be relevant to the topic
- First and last sentences should connect paragraph to the overall flow of the composition (to other paragraphs)

Steps for Successful Writing

■ **WRITING**

— Paragraph Content

- First and last words are important! *Always begin and end strongly*
- Avoid weak superfluous openings that only obscure your message and distract the reader:
 - “It is interesting to note that...”
 - “In order to keep the problem in perspective...”
 - “It goes without saying that...”
 - “So far we have been discussing what we call...”

Steps for Successful Writing

■ **WRITING**

— Paragraphs as Landmarks

- Paragraphs provide breaks in the text
- Alert the reader to the end of one topic and the beginning of another



Steps for Successful Writing

■ **WRITING**

— Paragraphs as Landmarks

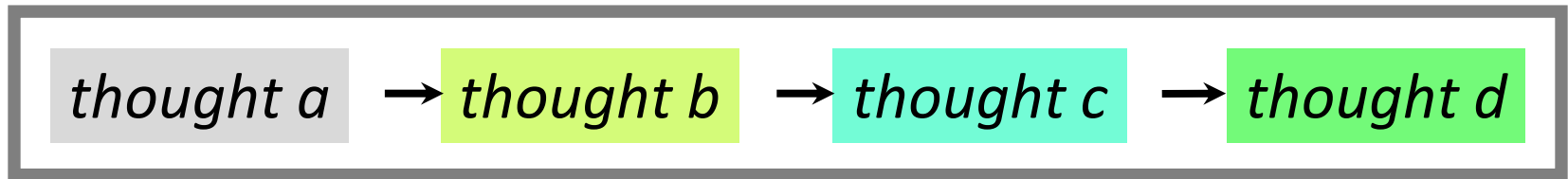
- Paragraphs vary in length
 - Length will depend on the number of thoughts specific for a topic
 - Short paragraphs easier to read than long paragraphs
- Paragraphs should be balanced
 - Ideas of comparable importance should be given similar emphasis

Steps for Successful Writing

■ WRITING

– Within a Paragraph – Sentences

- Each sentence should convey ONE thought
- Each sentence should connect to the preceding and following sentences



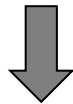
Overall grouping of sentences should convey your meaning

Steps for Successful Writing

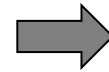
■ **WRITING**

— First Draft

Try to write the whole
of a short composition
in one sitting



Use your topic
outline as a guide



Use the words
that first come
to mind

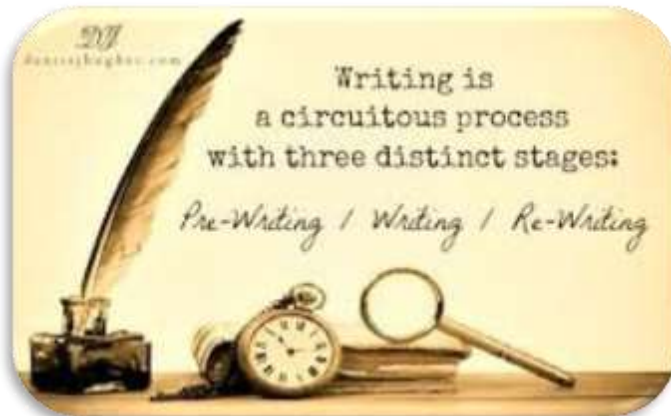


Don't stop to
revise...just get it on
paper! Revise later

Steps for Successful Writing

■ WRITING

- Write so that each word contributes to the sentence
- Each sentence should contribute to the paragraph
- Each paragraph contributes to the document



Steps for Successful Writing

■ **WRITING**

— Using your Topic Outline

- Your Topic Outline will allow you to ...

- *Contributes to appropriate sequence of ideas within your composition*
- *Promotes balance and clarity to your composition*

- *Start writing ...*
- *Treat each topic fully in one paragraph*
- *Emphasize your main points*
- *Make connections with other sections/paragraphs*
- *Write quickly with a uniform message*
- *Make a strong conclusion*

Steps for Successful Writing

■ **WRITING**

— Presenting Ideas and Information

- Present ideas, information in interesting and objective way
 - Use words with clear meaning
- Avoid figurative language
 - *The protein isolated by this procedure was pure as the driven snow.*

NO

Steps for Successful Writing

- **WRITING**

- Citing Sources

- Cite sources of information and ideas in the text
 - Citation format may be prescribed by journal or publisher
 - Bibliography at end provides full citation of referenced publications

Steps for Successful Writing

- **WRITING**

- Citing Sources

- Plagiarism

- Taking the work or ideas of someone else and passing it off as your own
 - Copying sentences with little or no change without attribution is plagiarism
 - <http://www.wpacouncil.org>

Steps for Successful Writing

■ EDITING

— Writing and Reading

- What the reader understands needs to match what the writer intends



Steps for Successful Writing

■ **EDITING**

— Helping the Reader

- Don't assume your meaning is “obvious” to the reader
 - Reader should NOT have to “figure it out”
- Start revision: check idea sequence
 - New ideas might be ill-placed in working draft
 - First attempt may not have most effective order
- Check words, phrasing
 - Wrong words, awkward or out-of-place phrases can confuse, distract reader

In-Class Activity – Assignment #4

- Write a plan and short outline for completing Assignment 4. Your plan should include a timeline.

- **Introduction**

- 1. Why is your research important?
 - 2. What is known about the topic?
 - 3. What are your hypotheses?
 - 4. What are your objectives?

- **Materials and Methods**

- 1. What materials did you use?
 - 2. Who were the subjects of your study?
 - 3. What was the design of your research?
 - 4. What procedure did you follow?

- **Results**

- 1. What are your most significant results?
 - 2. What are your supporting results?

- **Discussion and Conclusions**

- 1. What are the studies major findings?
 - 2. What is the significance/implication of the results?

In-Class Activity

Research Paper Introductions

- **1. Establish a research territory**

- a) Show that the general research area is important, central, interesting, and problematic in some way

- **2. Find a niche**

- a) Indicate a gap in the previous research, or extend previous knowledge in some way

- **3. Occupy the niche**

- a) Outline purposes or state the nature of the present research
 - b) List research questions or hypotheses
 - c) Announce principle findings
 - d) State the value of the present research

Draft – Peer Review Form

Written Report Assessment (Rating 1-5)

See Rubric Matrix next page for details about Rating Levels	Level 1. Not at all	Level 2.	Level 3. Some- what	Level 4.	Level 5. Very much	N/A
A. Organization and Communication <i>Does the report have a logical flow from the background to the research question, methodology, results and implications?</i>						
B. Abstract <i>Is the abstract a clear, succinct, and comprehensive summary of the report?</i>						
C. Background of Research <i>Does the report demonstrate a clear understanding of relevant facts and theories</i>						
D. Research Question and/or Hypothesis <i>What is the research question or hypothesis? What is the purpose of the study?</i>						
E. Methodology <i>Are the essential elements of the experimental procedures clearly described?</i>						
F. Results (Data & Analysis) <i>Does the report describe what was found and how the research question was answered or hypothesis tested?</i>						
G. Discussion and Conclusion <i>Does the discussion integrate pertinent information and relate the results to the research question and/or hypothesis? Does it lead logically to the conclusion?</i>						
H. Language Usage <i>Is the report informative and easy to read? Is the writing clear and logical?</i>						
I. Other Criteria <i>Please add your suggestions</i>						

Draft – Peer Review Form

<i>Focus Question</i>	Level 1	Level 2	Level 3	Level 4	Level 5
A. Organization and Communication <i>Does the report have a logical flow from the background to the research question, methodology, results and implications?</i>	Report is incomplete or missing information in several essential sections. Logical flow between the sections is a problem. Information is presented in a disorganized fashion.	Report has essential sections, but some are incomplete. Several sections are not internally coherent.	Report has all the essential sections. Some of the sections are incomplete or not logically coherent.	Report has all the essential sections including an abstract, references and acknowledgements. Most of the sections are internally coherent. Sections generally follow each other logically.	Report has the following essential sections: an introduction describing the background, central question or hypothesis; methodology; results (data, analysis); discussion and conclusion. An abstract, references, and acknowledgements are included. There is a logical flow within and between each section.
B. Abstract <i>Is the abstract a clear, succinct, and comprehensive summary of the report?</i>	Abstract does not describe clearly and succinctly the important points of the report.	Abstract omits one or more sections of the report. Important elements of the research report are not emphasized.	One or more sections of the report are not clearly summarized. Some important aspects of the research are not emphasized.	Abstract adequately summarizes all the sections of the report without highlighting its important elements.	Abstract briefly describes and highlights all the important aspects of the research report, including background, research question and/or hypothesis, methodology, results and conclusions. Length of abstract within 200-250 words.

Draft – Peer Review Form

C. Background of Research <i>Does the report demonstrate a clear understanding of relevant facts and theories?</i>	Report does not show a clear understanding of the background and pertinent literature in relation to the research question.	Some major articles have been omitted. The introduction does not relate the literature to the research question.	Some current and relevant articles have been omitted. The introduction does not show a clear relationship between the literature and the research question.	Report has a summary of literature from primary sources. Literature is pertinent to the research question or hypothesis. Introductory information is presented logically.	Report cites relevant literature from current primary sources; synthesizes pertinent literature; presents introductory information in a logical progression leading to the research question and/or hypothesis.
D. Research Question and/or Hypothesis <i>What is the research question or hypothesis? What is the purpose of the study?</i>	Research question or hypothesis is not formulated. The purpose of the study is not apparent.	The research question or hypothesis is not clear and the purpose of the study seems vague.	The research question or hypothesis is not clearly stated. The importance of the study is not apparent.	The research question or hypothesis was clearly stated, but the significance of the problem in relation to the literature is not fully described.	The research question and/or hypothesis are clearly stated. The significance of the problem is stated in context of the background information. The approach chosen addresses the research question or tests the hypothesis.
E. Methodology <i>Are the essential elements of the experimental procedures clearly described?</i>	It is difficult to understand the research method described in this report.	Several essential elements of the experimental procedure are missing. It would be very difficult for another scientist to repeat the experiment using the information from the report.	Descriptions of some procedures lack sufficient detail for another scientist to repeat the experiment.	Most of the procedures are described in sufficient detail so that another scientist can repeat the experiment.	The basic elements of each procedure are described and in sufficient detail so that other scientists can repeat the experiment. Values of the approach are described.

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Focus Question	Level 1	Level 2	Level 3	Level 4	Level 5
F. Results (Data & Analysis) <i>Does the report describe what was found and how the research question was answered or hypothesis tested?</i>	Presentation of the results is confusing and does not address the research question.	Data and analysis are not clearly presented. The importance of the results is not clearly stated.	Some results are not clearly described. The research question and/or hypothesis is not fully addressed.	Data, graphs, and images have descriptive legends and titles. Results addressed the research question.	Results (data, analysis, graphs, images and narrative) clearly address the research question and/or hypothesis. Representation of data and analysis (graphs and tables) is clear and effective. Graphs and tables have complete and descriptive legends and titles. Data analysis includes appropriate use of statistics.
G. Discussion and Conclusion <i>Does the discussion integrate pertinent information and relate the results to the research question and/or hypothesis? Does the discussion lead logically to the conclusion?</i>	The discussion has no clear focus and does not address the research question.	The discussion does not focus on the research question. There is no logical relationship between the results and the conclusion.	The discussion adequately addresses the research question or hypothesis. The significance of the study and its results are not clearly described.	Discussion of results clearly addresses the research question or hypothesis, arriving at a conclusion in a logical manner.	Discussion summarizes the results and relates them to pertinent literature. Places research question in the context of a "bigger picture" in the field. Presentation of results makes a compelling case for the conclusion. Report has a "take-home message".
H. Language Usage <i>Is the report informative and easy to read? Is the writing clear and logical?</i>	Report is disjointed and difficult to follow. Language usage does not always follow convention.	Report is disjointed. The writing sometimes lacks clarity.	Report is occasionally disjointed. It employs correct usage of language most of the time.	Report is clearly written, employing correct usage of language. The writing is logical and concise.	Report is clearly written with appropriate connections between ideas (transitions). The writing is logical and concise with correct usage of language. The writing is of professional quality.

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A. Organization and Communication <i>Does the report have a logical flow from the background to the research question, methodology, results and implications?</i>	Report is incomplete or missing information in several essential sections. Logical flow between the sections is a problem. Information is presented in a disorganized fashion.	Report has essential sections, but some are incomplete. Several sections are not internally coherent.	Report has all the essential sections. Some of the sections are incomplete or not logically coherent.	Report has all the essential sections including an abstract, references and acknowledgements. Most of the sections are internally coherent. Sections generally follow each other logically.	Report has the following essential sections: an introduction describing the background, central question or hypothesis; methodology; results (data, analysis); discussion and conclusion. An abstract, references, and acknowledgements are included. There is a logical flow within and between each section.
B. Abstract <i>Is the abstract a clear, succinct, and comprehensive summary of the report?</i>	Abstract does not describe clearly and succinctly the important points of the report.	Abstract omits one or more sections of the report. Important elements of the research report are not emphasized.	One or more sections of the report are not clearly summarized. Some important aspects of the research are not emphasized.	Abstract adequately summarizes all the sections of the report without highlighting its important elements.	Abstract briefly describes and highlights all the important aspects of the research report, including background, research question and/or hypothesis, methodology, results and conclusions. Length of abstract within 200-250 words.
C. Background of Research <i>Does the report demonstrate a clear understanding of relevant facts and theories?</i>	Report does not show a clear understanding of the background and pertinent literature in relation to the research question.	Some major articles have been omitted. The introduction does not relate the literature to the research question.	Some current and relevant articles have been omitted. The introduction does not show a clear relationship between the literature and the research question.	Report has a summary of literature from primary sources. Literature is pertinent to the research question or hypothesis. Introductory information is presented logically.	Report cites relevant literature from current primary sources; synthesizes pertinent literature; presents introductory information in a logical progression leading to the research question and/or hypothesis.
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