

Focusing on your Central Message

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This is one of the most important parts of writing your paper, and one that is often overlooked. Think carefully about what it is that you want your readers to understand about your work. Remember, we are all busy and we need to absorb your message quickly and clearly. Try these exercises:

1. Write down the three central points of your paper.
2. Summarize your paper in one sentence.
3. Describe your work to a colleague in one minute.

These might sound easy, but try them and you'll find out they aren't!

Don't rush this part of your planning. It is worth spending time getting it right. Once you have mastered these exercises you will feel more confident about the whole writing process that follows.

A common problem with summarizing your work is that there are usually several major findings. This exercise is meant to focus your thinking on the central issues. It is not going to form the published abstract. So, if you really can't squeeze your key message into one sentence don't worry. Try to do it in two. If you can't do that then you need to take a careful look at the reasons. Remember, this is a very important part of the process for writing papers so work at it. Talk to your colleagues and see if between you it is possible to highlight the central message of your work.

A number of studies have indicated that a badly written manuscript with poor use of English, even with good science, has less chance of being accepted and published.

Developing an Effective Title

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The title defines the contents of your manuscript in as few words as possible. An effective title “sells” your manuscript to the reader immediately and influences whether or not a reader will read the manuscript.

The title is essential in bringing your manuscript to the readers' attention, especially where the database being searched does not include the abstract of the article. It should include all essential words in the right order so the topic of the manuscript is accurately and fully conveyed. An excellent title is the key to ensuring your article will be found. An improperly titled paper may be lost and never reach its intended audience.

Your title will be read by many more people than the rest of your manuscript. Indexing services will use the title to categorize your paper. Authors who cite your paper will include the title in their list of references, which, in turn, will be read by thousands of readers.

1. Write the title early in the writing process and critique it the same as any other section of the manuscript.
2. A title should be the fewest possible words that accurately describe the content of the paper (the recommended length is 10 - 12 words).
3. The golden rule is: Express only one idea or subject in your title.
4. Put an important word first in the title.
5. Use key words which highlight the main content of your manuscript and can be understood, indexed, and retrieved by a database search.
6. Be concise. Omit all waste words such as "A study of ...", "Investigations of ...", "Observations on ...".
7. Eliminate redundant words such as verbs and articles so the title functions as a label rather than a sentence.
8. Use simple word orders and common word combinations.

9. Be as descriptive as possible and use specific rather than general terms: for instance, include the specific drug name rather than just the class of drug.
10. Write scientific names in full, for instance *Escherichia coli* rather than *E. coli*.
11. Avoid using abbreviations and acronyms; they could have different meanings: for instance "Ca" for calcium could be mistaken for "CA", which means cancer.
12. Refer to chemicals by their common or generic name instead of their formulas.
13. Avoid the use of Roman numerals in the title as they can be interpreted differently: for instance, part III could be mistaken for factor III.
14. Do not use words such as "significant", which are considered too strong, state your conclusion too boldly, and trivialize your manuscript by reducing it to a one-liner.
15. Make certain that your title and abstract match the final version of your article.

If you need additional help see our other newsletters such as *Twelve Steps to Developing an Effective First Draft of your Manuscript* at <http://www.sfcedit.net/newsletters.htm>.

Selecting a Journal

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Choosing to which journal to send your manuscript requires careful thought.

Many people leave the decision until they have written the manuscript. That is fine if you are experienced in publishing. You probably have identified two or three potential journals where to send your manuscript. However, if you are new – or even if you are experienced – in publishing, the more certain you are about which journal you are targeting, the easier it is to write the manuscript.

As will become clear, there are numerous factors to consider when choosing a journal. It is unlikely that one journal will have all of the features you are looking for, so you may have to compromise. However, there is one essential feature you should not compromise on – *manuscripts must be peer reviewed for publication if they are to be considered research articles.*

Once you decide on a journal, obtain and read that journal's *Instructions to Authors*. This document describes the format for your article and provides information on how to submit your manuscript.

Decide early before the writing begins. That way you can write for the journal's audience and according to their guidelines.

The following will help you make a short list of potential journals and decide which is the most appropriate and suitable journal for the manuscript you are planning to write:

1. Is the journal peer reviewed?
2. Does the journal *currently* publish papers on subjects such as yours? If you were looking for papers like your own, in which journals would you look?
3. Which journals have the best reputation for publishing in your field? Ask colleagues which journals they respect. Look at recent articles and judge their importance. Is the Editorial Board composed of leaders in their fields? What is the journal's *impact factor*?
4. Which journals are most likely to be cited by others in your field?
5. Is the journal published by a society? Society journals are usually the most prestigious and have the largest circulation. Be wary of new journals (in print or on the internet), especially those not sponsored by a society.

6. Is the journal indexed in the major electronic databases such as Medline, Biological Abstracts, Chemical Abstracts, Current Contents, etc.?
7. Which journals have the kind of expertise that would ensure your paper is given a “fair hearing”?
8. Are there journals whose readership you need/want to influence?
9. How often is the journal published? What is the usual time lag between receiving and publishing papers? Using the “date submitted”, the “date accepted”, and the date of the issue of published articles you can estimate the length of the review process as well as the time from acceptance to publication in print.
10. Is the journal published in English? English has become the language for international scientific communication. Therefore, if you are interested in communicating to the international scientific community, it is essential to publish in English. If you wish to communicate to a more localized community, you might choose a journal that permits another language.
11. What is the focus of the journal; is it broad or narrow? Which disciplines are represented? What is the journal’s research orientation; is it basic, theoretical, or applied?
12. Do you like the appearance of published articles – the format, typeface, and style used in citing references? If relevant, does the journal publish short and/or rapid communications?
13. Do the figures published in the journal have the resolution that you need?
14. Is speed an issue? If so, monthly journals have a shorter lag time than quarterly journals.

Once you have decided on a journal, you must obtain a copy of the most recent author guidelines. You can usually obtain a copy of the journal’s *Instructions to Authors* on their website or in the first issue of a new volume. You must follow these guidelines explicitly or you might delay the publication of your manuscript.

You should, by now, have some idea about why you want to publish, what kind of paper you will be writing, what your main message will be, who your primary readers are, and which journal you will be targeting.

You are now ready to prepare the first draft of your manuscript. See our newsletter *Twelve Steps to Developing an Effective First Draft of your Manuscript* at <http://www.sfcedit.net/newsletters.htm>.

Responding to Reviewers

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After submitting your manuscript, you will receive a letter from the journal's editor containing comments from the different reviewers, whose identities are normally kept confidential. The letter will either reject or provisionally accept your manuscript.

If the editor has rejected your manuscript, there will usually be reasons given for the decision. If that is the case, you need to assess the reviewers' comments to determine whether your manuscript might be accepted if you made certain revisions. In the majority of cases, the editor and reviewers will be trying to help you produce a high quality manuscript.

Do not take the reviewers' comments personally. In some instances it might be bad timing. The journal might have just accepted or published a similar study. You can always submit your manuscript to another journal. If you do, it is usually best to take the reviewers' comments into consideration. Even if you feel that the reviewers have misunderstood something in your paper, others might do the same. If the editor believes that the subject of your paper falls outside the scope of the journal, there is no point in challenging this. You have no choice but to submit your manuscript to another journal.

If your manuscript has been provisionally accepted, you now need to plan a strategy for revising your paper and gaining full acceptance. This will include resubmitting a revised manuscript and responses to the reviewers' comments.

The following will assist you in responding to the reviewers' comments and resubmitting your manuscript:

1. Read all of the comments from reviewers and the editor.
2. Never respond immediately. Allow yourself a few days to reflect on the comments.
3. If the comments from the editor and reviewers can be used to improve your manuscript, by all means, make those changes.
4. If your manuscript was rejected and you still feel that your work deserves publication, send it quickly to another journal. Some data can become less relevant if too much time passes.

5. If your manuscript has been provisionally accepted, it is a good idea to respond promptly. As soon as possible, begin drafting a polite, thoughtful, clear, and detailed response.
6. Be polite. Avoid a defensive or confrontational tone in your response. The goal is to extract helpful information from the comments, adopt any useful suggestions to improve your manuscript, and calmly explain your point of view when you disagree.
7. Respond completely to each comment in an orderly, itemized manner, and, if necessary, copy and paste into the letter any substantive changes made to the manuscript. There is no limit on the length of your response. Most editors are willing to read a long and complete response.
8. Change and modify your manuscript where it makes sense. You are not required to make every suggested change, but you do need to address all of the comments. If you reject a suggestion, the editor will want a good reason with evidence supported by references. Just because you prefer it your way is not a good enough reason.
9. Reviewers do not always agree with each other, in which case you must make a choice. Decide which recommendations seem more valid, and note in your response letter to the editor that you received conflicting advice and made what you think is the best choice.
10. If the reviewer is obviously wrong and has made a mistake, you are entitled to provide an argument and provide facts that can be referenced.
11. Sometimes you are asked to reduce considerably the length of the manuscript. You must not feel too attached to your words and should shorten the manuscript.
12. Ensure that what you say you have done to the manuscript, has in fact been done, and do make sure you follow the journal's guidelines. Editors become irritated when they find that comments made in the response letter do not match what is in the manuscript.

The process of getting a paper published in a scientific peer-reviewed journal is a challenging but rewarding one, once all your hard work finally pays off and the reprints arrive.

If you are interested in reading some of our other newsletters you can visit our website at <http://www.sfcedit.net>

Eleven Reasons why Manuscripts are Rejected

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Manuscripts submitted for peer review publication may be rejected for a number of different reasons, most of which are avoidable.

It should be noted that the reasons for accepting manuscripts are not the mirror image of the reasons for rejecting manuscripts. The main reasons for accepting manuscripts are: their contribution and relevance to the field, excellence of writing, and quality of the study design.

Many journals expect reviewers to assess the scientific merits and validity of research in submitted manuscripts; however, reviewers can become critical of manuscripts containing numerous language errors, which are difficult to eliminate without careful editing. Scientific writing demands both good science and well written manuscripts.

Following are the principal reasons why manuscripts are rejected. They are all equally important because reviewers tend to focus on different issues depending on their individual concerns and the journal's requirements.

- 1. Poor experimental design and/or inadequate investigation.** An inadequate sample size, a biased sample, a non-unique concept, and scientific flaws in the study are common faults.
- 2. Failure to conform to the targeted journal.** This is a common mistake. The focus of the manuscript is not within the scope of the journal and/or the guidelines of the targeted journal are not followed. This can easily be avoided by reading the targeted journal and reviewing the author guidelines.
- 3. Poor English grammar, style, and syntax.** Though poor writing may not result in outright rejection of a manuscript, it may well influence the reviewer's and editor's overall impression of the manuscript. It has been shown that a well written manuscript has a better chance of being accepted.
- 4. Insufficient problem statement.** It is important to clearly define and appropriately frame the study's question.
- 5. Methods not described in detail.** Details are insufficient to repeat the results. The study design, apparatus used, and procedures followed must be made clear. In some

cases it might be better to put too much information into the methods section rather than to put too little; information deemed unnecessary can always be removed prior to publication.

6. Overinterpretation of results. Some reviewers have indicated that a clear and “honest” approach to the interpretation of the results is likely to increase the chances of a manuscript being accepted. Identify possible biases and confounding variables, both during the design phase of the study and the interpretation of the results. Describe experimental results concisely.

7. Inappropriate or incomplete statistics. Using inappropriate statistical methods and overstating the implications of the results is a common error. Use an appropriate test and do not make the statistics too complicated. Quantify and present findings with appropriate indicators of measurement error or uncertainty (such as confidence intervals).

8. Unsatisfactory or confusing presentation of data in tables or figures.

The tables or figures do not conform in style and quantity to the journal’s guidelines and are cluttered with numbers. Make tables and graphs easy to read. Some editors may start by looking quickly at the tables, graphs, and figures to determine if the manuscript is worth considering.

9. Conclusions not supported by data. Make sure your conclusions are not overstated, are supported, and answer the study’s questions. Be sure to provide alternative explanations, and do not simply restate the results.

10. Incomplete, inaccurate, or outdated review of the literature. Be sure to conduct a complete literature search and only list references relevant to the study. The reviewers of your manuscript will be experts in the field and will be aware of all the pertinent research conducted.

11. Author unwilling to revise the manuscript to address reviewer’s suggestions.

This can easily be resolved. Taking the reviewers’ suggestions into account when revising your manuscript will nearly always result in a better manuscript. If the editor indicates willingness to evaluate a revision, it means the manuscript may be publishable if the reviewers’ concerns could be addressed satisfactorily.

For more detailed information regarding dealing with some of these issues, please review some of our other articles at <http://www.sfcedit.net/newsletters.htm>. These articles approach such subjects as Writing the First Draft, Writing Effective Results, Methods and Materials, Discussions, Selecting a Journal, Responding to Reviewers, etc.

Journal Submission Checklist

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It is important to prepare your manuscript properly, part of which is to follow the journal's guidelines. Using a checklist helps to ensure acceptance of your manuscript by the journal.

Almost all journals have their guidelines on their website as well as publish their guidelines quarterly or in every issue. Guidelines are subject to change, so be sure you have the most recent guidelines. Below is a general checklist to assist you in ensuring your manuscript meets all the journal's requirements. Every journal is different and not all journals will require all of the items listed. Depending upon the journal you are targeting, you might want to add specific items to this list.

Cover Letter

- Determine whether a cover letter is needed
- Address the correct editor according to the manuscript subject
- Use the correct address
- Review what is required in the cover letter

General

- Determine the article type you are submitting
- Use the correct font type and size
- Adjust the line spacing (single or double spacing)
- Check the format for section headings
- Put the sections in the correct order
- Check the word length limits
- Use line numbering, if required
- Use page numbers, if required
- Adjust the margin size
- Confirm that the nomenclature is correct
- Check spelling
- Determine whether the Results and Discussion are separate sections or included together in one section

Title Page

- Verify the allowed Title length
- Determine whether a running or short title is needed
- Check whether Keywords are needed
- Confirm whether a List of Abbreviations is needed
- Ensure that all authors are listed
- Make sure the author's names and address are in the correct format
- Include all corresponding author information

Abstract

- Confirm the word limit
- Determine whether a structured or unstructured abstract is needed

References

- Confirm that the in-text citation format is correct
- Verify that all references cited in the text are included in the Reference List
- Make sure that all references in the Reference List are cited in the text
- Determine whether the references are formatted correctly
- Check the accuracy of the references

Tables and Figures

- Ensure that the in-text mention of figures and tables is formatted correctly
- Determine whether the Tables and Figures are located in the correct location
- Verify that the correct fonts and font size are used in the tables and figures
- Confirm numbering format for tables and figures (Roman or Arabic)
- Ensure that the size of figures and tables are correct
- Check that the correct file format is used (pdf, jpeg, gif, etc.)
- Determine the type of list for table titles and figure legends
- Make sure that all tables and figures are mentioned in the text
- Determine whether vertical lines are allowed in tables

Other

- Determine whether a conflict of interest statement is needed
- Check to see whether funding sources are required
- For medical manuscripts: Include an ethical and patient approval statement

If you need help in beginning to write your manuscript, please read our article *Twelve Steps in Developing an Effective First Draft* at <http://www.sfcedit.net/newsletters.htm>.

Promoting Your Publication

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Having published an article in a journal doesn't mean it will be read or cited. So much is published every day, that most scientists will not have time to read everything. How will they know that you have just made an important contribution in your field unless they are specifically looking for your paper?

When you publish an article, there are steps you can take to ensure that your paper is distributed and comes to the attention of people within your relevant academic networks. One way of doing that is to send people a copy of your paper. Don't feel shy about doing so, you are actually doing them a favor: they won't need to search for it or photocopy it in the library.

You should consider sending a copy to all your relevant academic friends and contacts:

- colleagues in your department
- authors you cited in your paper
- other researchers or scientists who have published on the same subject or are working in that field
- people/organizations who supported your research
- junior researchers who are developing skills in the same field
- your institute's librarian
- relevant special interest groups, online discussion forums, any professional bodies of which you are a member
- your superiors
- others who helped in the study

It is useful to keep a list of such people and to add to it as you expand your network.

Most journals offer a reprint service - they will print off extra copies of your paper for you, provided that you order them in advance (and pay for them). If you have a list of potential recipients of your paper, you will know how many reprints to order.

If you plan to send copies to policy makers or other non-specialists, you should prepare a cover letter summarizing the paper in non-technical language, explaining why you think it is important they should know about the content of your paper.

Since most papers are found online through search engines and databases, it is very important to use good descriptive keywords that cover all the key concepts and contexts of the article. Your title should also be descriptive to facilitate a database search of your paper.

You should have a website within your organization or on your own where all your published work is easily downloadable. This is one way to save on reprint costs. However, you would need to send out a brief letter to those on your list informing them of your research so they will visit your website and download your paper.

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Effective Use of Numbers and Statistics

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English grammar and syntax are important in the writing of scientific manuscripts, but the use and presentation of numbers and statistics are just as important. The misuse of numbers and statistics can jeopardize the acceptance of your manuscript by the journal.

Numbers and data are the core of most scientific research. Although there are many ways to present data; every journal has specific guidelines for their use and presentation. Whatever style you choose, it is important to be consistent throughout the manuscript.

Statistics should be used to substantiate your findings and help you to state objectively your significant results. Statistics in text should include sufficient information, be reported accurately, and permit the reader to corroborate the analysis. It is always wise to have a Statistician check your work before submitting your manuscript.

The list presented here covers some general guidelines to which most journals adhere, but check with the journal to determine their specific guidelines.

Numbers:

- Preferably use Arabic rather than Roman numerals.
- Use the symbol ~ to mean: approximately equal to.
- When beginning a sentence with a number, spell out the number. It is usually better to rewrite a sentence so you don't start it with numbers greater than ninety-nine.
- When several numbers appear in the same sentence or paragraph, express them all in the same way.
- Use numbers and words to express large numbers: a budget of \$1.2 million; 2 million kilometers.
- Use hyphenation to reduce confusion when there is more than one modifier: fifteen 2-week-old mice.
- Use Arabic numbers for units such as weights, percentages, and time.

- Put a space between numbers and units: for example, 75 kg. The exception: 75% for some journals.
- Do *not* use leading zeros before a decimal point when the number cannot exceed 1. For example, report $a = .05$. *Do* use leading zeros before a decimal point when the number can be greater than 1. For example, report mean serum creatinine level = 0.973 mg/dl.
- When you quote numbers, make sure you use the minimum number of significant digits or decimal places. For example, 23 ± 7 years is appropriate but not 23.4 ± 6.6 years; the loss of accuracy is not important because the measurement is not significant to the first decimal place. However 23.4 ± 0.6 is correct because this measurement is accurate to the first decimal place.

Statistics:

- Always report the mean (average value) along with a measure of variability (standard deviation(s) or standard error of the mean). Make sure the significant digits of the mean and standard deviation are consistent.
- Summarize frequency data in the text with appropriate measures such as percents, proportions, or ratios.
- For summary statistics (e.g., means, standard deviations), report one digit more than was present in the raw data. For example, if age is recorded to the nearest whole year, report the mean age to the nearest tenth of a year (e.g., mean = 54.3 years).
- For percentages, the nearest whole percent (e.g., 25%) is usually adequate, although many journals prefer percentages to the nearest tenth of a percent (e.g., 25.4%).
- For test statistics, such as chi-square statistics, t statistics, and F statistics, use two decimal place accuracy. For example, report t statistic = 2.56.
- For P values, two significant digits are usually acceptable.
- Show 95% confidence intervals for effect statistics like a correlation coefficient or the difference between means.

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Fourteen Steps to Writing Clearly

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Writing clearly is a worthwhile goal for any scientist, at least any scientist who expects to be published in a major journal.

Writing well means presenting your argument and evidence in a clear, logical, and creative way. An interesting argument hidden in flowery prose is of no use to anyone.

Clear writing takes effort. Besides requiring knowledge of basic grammar and syntax, it requires a good ear, a sense of proportion, and an ability to critique oneself.

Ultimately, anyone who wants to write clearly needs to develop a critical sense. You need to be able to judge your own writing objectively and, putting aside the brilliance of the content, honestly evaluate its ability to communicate.

Below are a few tips useful to anyone writing for scientific journals.

By critiquing your papers with the following ideas in mind, you'll definitely sharpen your writing and improve your odds of publication.

- 1. Determine what you're trying to say before writing it.** Figure out precisely what you want to say. This may sound obvious, but many do not bother to do it. Knowing what you want to say beforehand maximizes the odds of producing an organized, persuasive paper.
- 2. Think in terms of an outline.** To ensure a logical flow, start by making an outline (even if it's in your head). Please see our newsletter "Eight Steps to Developing an Effective Outline"
- 3. Write direct sentences.** Have only one idea or point per sentence. Keep sentences simple and short. Use two sentences rather than joining them with "and".
- 4. Be brief.** Conciseness is important in writing research papers. Learn to look for long phrases that can be shortened.
- 5. Organize your thoughts.** Be sure that every paragraph has a clear topic sentence and that the paragraph content supports the topic. Remember, the goal is to report your findings and conclusions clearly, with as few words as necessary.

6. Substitute action verbs for "to be". "To be" is an important verb, but it weakens the text when used excessively. For example, think about changing "is a summary of" to "summarizes".

7. Be sparing with adjectives & adverbs. Try to remove unspecific modifiers such as "very," "extremely," and "highly". When you do use modifiers, make them as specific as possible. For example, try changing "a very good response" to "the expected response".

8. Be as precise as possible. Avoid phrases such as "a number of" and "a quantity of". If you can, replace these with a word such as "many," "few," or "some," or, even better, the actual number.

9. Avoid unnecessary constructions and prepositions. Phrases such as "It is clear that" and "The fact is that" are empty verbiage. Assuming you believe what you are about to say, just say it.

The same is true for prepositional phrases such as "In order to" or "In an attempt to." "In order to understand this reactions, we . . ." is better said as "To understand this reaction, we. . ."

10. Look for omissions. Did you forget an essential sentence or two in your conclusion that explains your thought processes to someone who doesn't think about these issues every day?

11. Look for repetitions. When you see the same word used repeatedly, consider using synonyms. Although repeating a word or phrase is sometimes effective rhetorically, it can also make your sentence structure clumsy.

12. Write as you speak. Wherever possible, use words you ordinarily speak and hear. If you can't hear yourself saying it, then don't see yourself writing it.

13. Leave it alone for a while. Of course, there's not always time, but do this whenever you can. You will be surprised how many flaws will appear in your manuscript when you put it aside for a while.

14. Edit, edit, edit.

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Effective Word Usage in Scientific Writing

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A sentence should contain no unnecessary words. In scientific manuscripts precise writing is especially important because of the emphasis on conveying quantitative information efficiently. In reporting and recording research, try to be as accurate and precise in describing as in conducting the research.

Following is a list of words and expressions that are useless or incorrect in scientific writing, with suggested alternatives. This is not a complete list but contains some of the most troublesome words most frequently found in scientific manuscripts.

Don't use

based on the fact that

for the purpose of

fact

prove

plays an important role

decreased number of

time period

longer time period

brown in color

round in shape

a number of

has been shown to be

Better

because

for / to

evidence

support

is important because

fewer

time

longer

brown

round

some

is

by means of	by
it is possible that	may
in order to	to
during the course of	during
a majority of	most
a great number of times	often
in other words	thus / hence / therefore
despite the fact that	although
first of all	first
it is interesting to note that	<i>eliminate</i>
it may seem reasonable to suppose that	<i>eliminate</i>

To ensure accuracy and preciseness in your writing:

- Use an English spelling checker
- Make sure you use words according to the precise meaning understood by the average person.
- Ideally, check whether every word could be deleted or replaced by a better one.

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Effective Use of Grammar and Style

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Grammar and style are very important and helpful in meeting the writing process goal of ensuring the clear communication of ideas.

Grammar includes any writing problem for which there is a definitive right or wrong answer. Errors in grammar disrupt and confuse readers, making your meaning unclear.

Style includes any issue that is a matter of preference. Each journal has its own expectations about what's appropriate in writing. Some journals differ dramatically in what stylistic choices are acceptable.

Below we list some common grammar and style issues. There are, of course, many more.

Grammar

It is important that your manuscript be written in correct English grammar. Most journals will reject a manuscript if it is not written in correct English, even if the content is worthy of publication.

Subject-Verb: The correct form of a verb is determined by the subject of the phrase and not the noun that precedes the verb. Place the verb as close to the subject as possible.

Which versus That: "That" introduces essential information, but phrases that begin with "which" give additional, nonessential information and are set off by commas.

Dangling and Misplaced Modifiers: Be sure modifiers actually modify what they are intended to modify. Keep modifying phrases as close as possible to the word they modify to avoid distorting the meaning of the sentence.

Verb tense: Use the past tense for the Materials and Methods, and the Results. Use the present tense to describe established experiments and data that exist in the literature. It is important to check the journal's requirements.

Articles: Most nouns in English are preceded by an article (e.g., "a," "an," "the," "several") every time they are used. This applies to nouns directly preceded by an adjective. However, there are instances where no article is needed. There are many contradictory elements of English grammar.

Comparative terms: Comparative terms are words and phrases such as, bigger,

smaller, more, less, etc. Sentences containing a comparative term without completing the comparison are meaningless.

Split Infinitive: An infinitive is made up of two words, usually the word “to” in front of the bare verb, such as “to measure”. A split infinitive puts an adverb between the two parts of the infinitive. “To carefully measure” is a split infinitive. “Carefully” splits “to measure.” As a general rule, you should avoid splitting infinitives.

Style

Most journals require their own writing style. The author guidelines usually explain in detail the journal’s requirements. Here are some general tips for ensuring you adhere to the journal’s requirements.

Tone: Your writing, depending upon the journal’s style or your audience, should be either formal and structured, or informal and loosely organized.

Passive vs. Active Voice: Many journals believe the passive voice is more objective and, therefore, more suitable for scientific writing. However, we suggest using the active voice wherever appropriate. You should check the author guidelines or review some of the journal’s articles to determine the journal’s style.

First vs. Third Person: If there is one stylistic area where scientific disciplines and journals vary widely, it is the use of first vs. third person constructions. Limit your use of first person construction (i.e., “I (or we) undertook this study ...”).

Abbreviations and Acronyms: An abbreviation or acronym is justified only if the full expression is excessively long or if the abbreviation is well known to all researchers in the discipline. When using an abbreviation or acronym, define it in parentheses the first time it is used.

References: It is very important to make sure all references are cited in the text and in the required format.

Numbers: Numbers should be spelled out when they begin a sentence.

Wordiness: Words that don't enhance content or meaning may bog down the reader. Effective writers use as few words as possible to convey precisely their information or ideas.

For more detailed information regarding writing a manuscript for publication, please review some of our other articles at <http://www.sfcedit.net/newsletters.htm>. These articles approach such subjects as Writing the First Draft, Writing Effective Results, Methods and Materials, Discussions, Selecting a Journal, Responding to Reviewers, etc.

Eight Steps to Developing an Effective Outline

San Francisco Edit

www.sffedit.net

Preparing an outline is the most important step in the process of producing a manuscript for publication in a journal. The outline bears roughly the same relation to the final manuscript as an architectural blueprint does to a finished house.

Its purpose of an outline is to divide the writing of the entire paper into a number of smaller tasks.

A good outline will organize the various topics and arguments in logical form. By ordering the topics you will identify, before writing the manuscript, any gaps that might exist.

There is no single best way to prepare a scientific manuscript, except as determined by the individual writer and the circumstances. You should know your own style of writing best. Whatever you decide to do, you should follow at least these steps before beginning to write your manuscript.

Remember, at this stage, you are only constructing an outline. You are not writing; you just need to put down some notes to guide your thinking.

1. Develop a central message of the manuscript

Prepare a central message sentence (20-25 words). If you were asked to summarize your paper in one sentence, what would you say? Everything in the manuscript will be written to support this central message.

2. Define the materials and methods

Briefly state the **population** in which you worked, the **sampling method** you employed, the **materials** you used, and most importantly, the **methods** you used to carry out the study

3. Summarize the question(s) and problem(s)

What was known before you started the study? What answers were needed to address the problem(s)? List the key points pertaining to the question(s) and problem(s). What did you do to answer the question(s)?

4. Define the principal findings and results

Your central message sentence probably encapsulates the most important findings. There may be others that you feel ought to be included. List these in note form. Don't worry about the order or about how many you put down.

5. Describe the conclusions and implications

Make brief notes on each of the implications that arise from your study. What are the principal conclusions of your findings? What is new in your work and why does it matter? What are the limitations and the implications of your results? Are there any changes in practice, approaches or techniques that you would recommend?

6. Organize and group related ideas together

List each key point separately. Key points can be arranged chronologically, by order of importance or by some other pattern. The organizing scheme should be clear and well structured. You can use a cluster map, an issue tree, numbering, or some other organizational structure.

Identify the important details, describe the principal findings, and provide your analysis and conclusions that contribute to each key point.

7. Identify the references that pertain to each key point

8. Develop the introduction

Before beginning on the introduction, read through the notes you have made so far in your outline. Read them through and see whether there is a coherent and cohesive story and a unifying theme that runs through the outline.

Your introduction outline should start with the main message, describe what the purpose or objective of your study was, how you went about doing the study, what you found and what are the implications of what you found.

Developing an Effective Poster Presentation

San Francisco Edit

www.sfcedit.net

Since we have been receiving posters to edit for meetings, we decided to publish a newsletter on developing an effective poster presentation.

Using a combination of visuals and text, posters communicate concepts and data to an audience, allowing the author to meet and speak informally with interested viewers. Poster presentations provide an opportunity for investigators to present their work at scientific meetings and are preparatory for publication in a peer-reviewed journal.

Here is some advice to help you in developing an effective poster.

Plan, Plan, Plan. Start the process early. Planning is crucial. Start with the due date and work back to create milestones. Allow time for peer review and heavy editing. Make it simple, attractive, and large.

Follow the Guidelines. Just like with a manuscript, you need to follow the guidelines established by the meeting. It is your responsibility to know the physical requirements for the poster, including acceptable size and display format.

Graphics. Let graphics and images tell the story; use text sparingly. All visuals should relate to all your points and conclusions. Usually 4-6 figures are included in a poster. Make them simple, readily comprehensible, and self-contained. Keep figure legends very short (10-25 words maximum).

Organization. Organize posters for a vertical flow of information (up to down in columns) so the audience can view the entire poster in one left-to-right pass. Keep the sequence well ordered and obvious. If necessary, use cues - numbers, letters, arrows - to guide them.

Headings and Title. Use headings to help guide individuals through your poster, find your main points, and summarize your work in large letters. A reader should be able to get the main points from the headings alone. Headings should be at least 36 point in size, the title, at least 5 cm tall.

Text. The text should be readable, at least 24 point in size. We recommend that you use bulleted points and use an active voice. Keep text elements to 50 words or fewer. If you can read all aspects of the text when you are standing above it, then the font size is adequate. Individuals will likely be viewing and reading your poster at a distance of about 3 feet.

Fonts. There are two styles of fonts, sans serif and serif. For bullet points use sans serif fonts such as Arial, Helvetica, and Avant Garde. Since they are easier to read, use serif fonts, such as Times, Roman, and Palatino, for blocks of text.

Poster Size. Check well in advance the size poster you will be permitted to display. Plan your poster so that it will make the best use of this space without exceeding it.

Colors: Use a light color background and dark color letters for contrast. Use a theme of only 2-3 colors and avoid overly bright colors.

Mounting. Since you will need to transport the poster to the conference, don't try to mount all of the text onto one large piece of poster board – use several smaller pieces. If you are able, create the entire poster on a single large computer generated page. This can be rolled into a tube and transported easily. This has the added advantage of enabling you to print out a miniature version and providing it to people who come to your presentation.

Presentation. Your poster is not your presentation, only your visual aid. Everything you put on your poster relates to a carefully crafted message. Plan and practice a three-minute presentation (Introduction: 0.5 min., Main points: 2 min, Closing: 0.5 min). Visitors to your poster may ask for additional details, so be prepared to provide more information if requested.

Questions. You should be able to anticipate many of the questions individuals will have and you should prepare and practice a response to those questions.

Mistakes. The three most common mistakes made in constructing a poster are (1) including too much text, (2) using a font size that is too small, and (3) not planning for the available space.

For more detailed information regarding writing a manuscript for publication, please review some of our other articles at <http://www.sfdedit.net/newsletters.htm>. These articles approach such subjects as Writing the First Draft, Writing Effective Results, Methods and Materials, Discussions, Selecting a Journal, Responding to Reviewers, etc.

Twelve Steps to Writing an Effective Conclusion

San Francisco Edit

www.sfeddit.net

Conclusions are often the most difficult part to write, and many writers feel they have nothing left to say after having written the paper. However, you need to keep in mind that most readers read the abstract and conclusion first. A conclusion is where you summarize the paper's findings and generalize their importance, discuss ambiguous data, and recommend further research. An effective conclusion should provide closure for a paper, leaving the reader feeling satisfied that the concepts have been fully explained.

1. Be sure to read the journal's guidelines regarding Conclusions. Always be mindful that different types of scientific papers will require different types of conclusions. For example, some journals require the Conclusions to be part of the Discussion and others, to be a separate section. It is also beneficial to read Conclusions of published articles in the journal you are targeting.
2. Begin with a clear statement of the principal findings. Authors commonly make the mistake of hiding this message deep within the Conclusions.
3. Open with a statement that conveys enough information to cause the reader to carry on reading. The next few sentences should elaborate, if necessary, on the opening statement.
4. State your conclusions clearly and concisely. Be brief and stick to the point.
5. Explain why your study is important to the reader. You should instill in the reader a sense of relevance.
6. Prove to the reader, and the scientific community, that your findings are worthy of note. This means setting your paper in the context of previous work. The implications of your findings should be discussed within a realistic framework.
7. Strive for accuracy and originality in your conclusion. If your hypothesis is similar to previous papers, you must establish why your study and your results are original.
8. Conclude with how your testing supports or disproves your hypothesis. By the time you reach the end of your conclusion, there should be no question in the reader's mind as to the validity of your claims.

9. **Do not** rewrite the abstract. Statements with “investigated” or “studied” are not conclusions.

10. **Do not** introduce new arguments, evidence, new ideas, or information unrelated to the topic.

11. **Do not** apologize for doing a poor job of presenting the material.

12. **Do not** include evidence (quotations, statistics, etc.) that should be in the body of the paper.

If the journal requires a statement regarding the need for further research, it should be used to point out any important shortcomings of your work, which could be addressed by further research, or to indicate directions further work could take.

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Optimizing Your Paper for a Search Engine

San Francisco Edit

www.sfcedit.net

Optimizing your paper for academic and web based search engines will greatly increase its chance of being viewed and/or cited in another manuscript.

Nowadays, most research information, if not all, is retrieved online through search engines and databases. It is therefore very important to provide good, descriptive keywords in you paper covering all the key concepts and contexts of your manuscript.

When you publish a paper, you can take measures to ensure your paper and research maximizes its potential within relevant academic networks. The number of citations a paper receives helps to determine the impact of your research. Even if your research is excellent, if no one finds your paper, it won't be cited. The closer your paper is to the number one search result, the more likely it will be read.

The crucial areas for optimization are your paper's abstract, title, and, as required by some journals, a list of keywords. All of these areas of your paper are freely available online through search engines.

When selecting keywords, think about your own online searches, choosing the keywords that most accurately describe your paper and the terms you would use if searching for it. Points to remember are:

Be descriptive: Keywords should describe as specifically as possible the topic about which you are writing. Keywords should identify your topic, academic subdiscipline, methodology, and anything that describes your research. Since it is not possible to optimize your manuscript with dozens of keywords, it is better to choose a few.

Choose your search terms carefully: Keywords should reflect a collective understanding of the subject. They should not be very unique, technical, and only understood by a small number of experts.

Develop a clear, descriptive title: Ensure the title contains the most important words related to the topic. Make your titles short, concise, and descriptive,

Focus on key phrases in the abstract: Key phrases, a maximum of three or four different ones, need to flow well and make sense within the abstract.

Use synonyms: Since some search engines do not index the document's full text,

synonyms of important keywords should be mentioned a few times in the body of the text as well as in the abstract. Using synonyms, someone who does not know the common terminology used in the research field can find your paper.

Check the competition for the words you have chosen: It is a good idea to test your keywords in popular web search engines. If the search returns hundreds of documents, it may be better to choose another keyword with less competition. You can check the competition for your keywords in Google. There are tools that help, such as Google Trends, Google Insights, and Google Keyword.

Consider the journal's policies regarding keywords: As part of the optimization process, you need to consider the journal's or publisher's policies.

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Sentence Structure in Scientific Writing

San Francisco Edit

www.sfcedit.net

Scientific writing must be precise, often requiring a fine level of detail. Though careful description of objects, forces, organisms, methodology, etc., can easily lead to complex sentences expressing too many ideas without a break point, scientific writing should be in easily understood complete and simple sentences.

Nearly every form of scientific communication is space-limited. Grant proposals, journal articles, and abstracts all have word or page limits, creating a premium on concise writing. Furthermore, adding unnecessary words or phrases distracts rather than engages the reader. Your reader will decide whether or not your paper is interesting based on the content, not on the complexity of your sentences.

Here are some suggestions regarding sentence structure to ensure you are constructing precise and easily understood sentences:

1. Create sentences using carefully chosen subjects and strong verbs to express your central meaning.
2. Omit needless words and empty phrases such as "the fact that," "it should be noted that," and "it is interesting that" (see our newsletter on word usage at <http://www.sfcedit.net/newsletters.htm>).
3. Use definite, specific, and precise language, avoid overuse of figurative language and technical jargon. Scientific terminology carries specific meanings - use it appropriately and consistently.
4. Choose a familiar term instead of a technical or obscure term. The more familiar term is preferable when it doesn't reduce precision.
5. Use quantitative rather than qualitative descriptions whenever possible.
6. Use the active voice and active constructions as much as possible, the passive voice only sparingly.
7. Keep related words together. Subjects should be close to their verbs, modifiers near the words they modify.
8. Express parallel ideas in parallel form. Parallel ideas are ideas equal in logic and importance.



9. Include only interesting and noteworthy information.

10. Write simple and direct sentences. English is easiest to understand that way.

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Common Errors in Scientific Manuscripts

San Francisco Edit

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As editors of scientific manuscripts we have noticed the recurrence of certain errors related to the structure of the manuscript. We have listed below the most common errors to avoid in order to speed up the acceptance and publishing process. This, of course, is not a complete list because every journal has their specific guidelines. Besides being aware of these common errors, you, as an author, need to review the guidelines of the journal where you are planning to submit your manuscript.

The Title

1. It is too long or too short.
2. Does not match the article or study design.
3. Includes abbreviations, jargon, or attempts to be witty at the expense of clarity.
4. Inadequately describes the study.

The Abstract

1. Abstract results are not the same as the reported results.
2. Abstract methods are different than the methods in the manuscript.
3. Abstract conclusion is different than what is stated in the manuscript.
4. Exceeds the word limit allowed by the journal.
5. It is formatted incorrectly for the journal (eg. unstructured versus structured).

The Introduction

1. Does not describe the purpose and objective of the study.
2. Does not mention the importance and originality of the study.
3. Contains material unrelated to the study.
4. Contains material belonging in other sections of the manuscript.
5. It is not interesting.

The Methods

1. Some methods reported are not used.
2. Some methods are missing, thus not allowing the duplication of the study.
3. Reports statistical methods incorrectly or poorly.
4. Described methods do not relate to the results.

The Results

1. Reports data incompletely.
2. Contains results from another study.
3. Information repeats what is shown in the tables and figures.
4. Includes discussion or methods.

The Discussion

1. It is biased and omits findings from other studies.
2. Does not explain key results.
3. Does not describe the limitations of the study.
4. Does not characterize speculation as such.
5. Includes information unrelated to the study.
6. Includes outdated references or misrepresents them.
7. Overstates the importance of the study.
8. It is too expansive and lacks a logical flow.

The Conclusion

1. Just restates the content from other sections of the manuscript.
2. Includes statements not supported by the study.
3. Does not clearly relate the findings to the purpose of the study.
4. Contains unnecessary information.

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Effective Use of Software in Scientific Presentations

San Francisco Edit

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Many communication experts agree that there is a right and a wrong way to use presentation software like PowerPoint or Keynote. If used correctly, the software can greatly enhance your presentation. Here are some technical tips to assist you in developing an appropriate presentation.

1. Learn to use the software. Use the software's templates, accepting its defaults for point size, margins, and placement.
2. Keep the layout and style as consistent as possible.
3. Choose colors with care. The text and background colors should contrast, dark letters on a light background for small rooms, light letters on a dark background for large rooms. The background should be a solid color, no fading, photos, etc. Avoid red-green combinations because a significant fraction of the human population is red-green colorblind.
4. Use animated features in moderation. Overuse of these effects, such as slide transitions and custom animations, can be distracting. Focus should be on the content.
5. Strive for simplicity and visibility. Eliminate any words, lines, and diagrams that do not add essential information to the slide.
6. Display data using diagrams and figures instead of tables; they are easier for the audience to comprehend.
7. Keep tables simple. There should only be one table per slide. The font size for the data should not be smaller than 22 point. If you need to decrease the font size to have the table fit on the slide, eliminate some of the data or do not use the table.
8. Use fonts at least 36 point in size for titles, 28 point for main bullets, and 24 point for sub-bullets. If it can't be, read it's a waste.
9. Limit text blocks to no more than two lines each. Do not have large text blocks containing paragraphs; the audience will spend time reading the text and ignore what you are saying.
10. Use a heading on every slide.



11. Limit the number of items on each slide. Each slide should make just one or two points using 7-9 lines maximum.
12. Avoid using too many words in bold, italics, or capital letters.
13. Use the same font throughout to avoid distraction. Sans serif fonts (e.g., Arial) are easier to read and more attractive than fonts with serifs (e.g., Times New Roman).
14. Using “builds” in diagrams and text slides can be very useful. Text builds can be made even more effective if you darken previous text as new material is added.
15. Control the number of slides. Budget 2-3 minutes per slide (e.g. 30 minute talk = 10-15 slides).
16. Practice with feedback and then practice some more.

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Twelve Steps to Developing an Effective First Draft of your Manuscript

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You should now have detailed notes you can use to write your draft paper. If you don't have one already, it may help to prepare an outline for each section which includes a number of major headings, sub-headings and paragraphs covering different points. If you need help in preparing an outline see our article *Eight Steps to Developing an Effective Manuscript Outline* at www.sffedit.net/newsletters.htm. At this point you will need to convert your notes and outline into narrative form.

Some people recommend that you begin with the Introduction and continue in order through each section of the paper to help ensure flow. Others suggest that you begin with the easiest sections, which are usually the Methods and Results, followed by the Discussion, Conclusion, Introduction, References and Title, leaving the Abstract until the end. The main thing is to begin writing and begin filling up the blank screen or piece of paper.

- 1. Consolidate all the information.** Ensure you have everything you need to write efficiently, i.e., all data, references, drafts of tables and figures, etc.
- 2. Target a journal.** Determine the journal to which you plan to submit your manuscript and write your manuscript according to the focus of the targeted journal. The focus may be clearly stated within the journal or may be determined by examining several recent issues of the targeted journal.
- 3. Start writing.** When writing the first draft, the goal is to put something down on paper, so it does not matter if sentences are incomplete and the grammar incorrect, provided that the main points and ideas have been captured. Write when your energy is high, not when you are tired. Try to find a time and place where you can think and write without distractions.
- 4. Write quickly.** Don't worry about words, spelling or punctuation at all at this stage, just ideas. Keep going. Leave gaps if necessary. Try to write quickly, to keep the flow going. Use abbreviations and leave space for words that do not come to mind immediately.
- 5. Write in your own voice.** Expressing yourself in your own way will help you to say what you mean more precisely. It will be easier for your reader if they can "hear" your voice.

6. Write without editing. Don't try to get it right the first time. Resist the temptation to edit as you go. Otherwise, you will tend to get stuck and waste time. If you try to write and edit at the same time, you will do neither well.

7. Keep to the plan of your outline. Use the headings from your outline to focus what you want to say. If you find yourself wandering from the point, stop and move on to the next topic in the outline.

8. Write the paper in parts. Don't attempt to write the whole manuscript at once, instead, treat each section as a mini essay. Look at your notes, think about the goal of that particular section and what you want to accomplish and say.

9. Put the first draft aside. Put aside your first draft for at least one day. The idea of waiting a day or more is to allow you to "be" another person. It is difficult to proofread and edit your own work; a day or more between creation and critique helps.

10. Revise it. Revise it and be prepared to do this several times until you feel it is not possible to improve it further. The objective is to look at your work not as its author, but as a respectful but stern critic. Does each sentence make sense? In your longer sentences, can you keep track of the subject at hand? Do your longer paragraphs follow a single idea, or can they be broken into smaller paragraphs? These are some of the questions you should ask yourself.

11. Revise for clarity and brevity. Revise sentences and paragraphs with special attention to clearness. For maximum readability, most sentences should be about 15-20 words. For a scientific article, paragraphs of about 150 words in length are considered optimal. Avoid using unnecessary words.

12. Be consistent. Often a manuscript has more than one author and therefore the writing may be shared. However, the style needs to be consistent throughout. The first author must go through the entire manuscript and make any necessary editorial changes before submitting the manuscript to the journal.

Ten Steps to Writing an Effective Abstract

<http://www.sffedit.net>

An abstract is a condensed version of the manuscript, which highlights the major points covered, concisely describes its content and scope, and reviews its material in abbreviated form. It is usually the first section read and sets the tone of the paper for the reviewer. It must be concise and easy to read and must cover the important points of the paper.

Many publications have a required style for abstracts; the "Guidelines for Authors" provided by the publisher will provide specific instructions. Stay within the publisher's guidelines, or your manuscript might be rejected.

Writing an abstract involves summarizing a whole manuscript and providing as much new information as possible. The best way to write an effective abstract is to start with a draft of the complete manuscript and follow these 10 steps:

1. Identify the major objectives and conclusions.
2. Identify phrases with keywords in the methods section.
3. Identify the major results from the discussion or results section.
4. Assemble the above information into a single paragraph.
5. State your hypothesis or method used in the first sentence.
6. Omit background information, literature review, and detailed description of methods.
7. Remove extra words and phrases.
8. Revise the paragraph so that the abstract conveys only the essential information.
9. Check to see if it meets the guidelines of the targeted journal.
10. Give the abstract to a colleague (preferably one who is not familiar with your work) and ask him/her whether it makes sense.

Writing an effective abstract will improve the chances of your manuscript being accepted, encourage people to read it, and increase its impact.

A number of studies have indicated that a badly written manuscript with poor use of English, even with good science, has less chance of being accepted and published.

Ten Steps to Writing an Effective Introduction

San Francisco Edit

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The purpose of the Introduction is to stimulate the reader's interest and to provide pertinent background information necessary to understand the rest of the paper. You must summarize the problem to be addressed, give background on the subject, discuss previous research on the topic, and explain *exactly* what the paper will address, why, and how. Besides motivating a reader to read your manuscript and to care about your results, the Introduction is useful also to the journal's reviewers and editors in judging the importance of your manuscript.

An Introduction is usually 300 to 500 words, but may be more, depending on the journal and the topic. Therefore, the Introduction needs to be very concise, well structured, and inclusive of all the information needed to follow the development of your findings.

Some people recommend that the Introduction be the first section written when writing a manuscript. If you need help beginning, please read our article *Twelve Steps in Developing an Effective First Draft* at <http://www.sfcedit.net/newsletters.htm>.

Below are the steps in developing an effective Introduction. However, since every journal is different, it is important that you look at papers in your targeted journal to determine whether they use all of these steps. For example, some journals do not include conclusions in the Introduction.

1. Begin the Introduction by providing a concise *background* account of the problem studied.
2. State the *objective* of the investigation. Your research objective is the most important part of the introduction.
3. Establish the *significance* of your work: Why was there a need to conduct the study?
4. Introduce the reader to the pertinent *literature*. Do not give a full history of the topic. Only quote previous work having direct bearing on the present problem.
5. Clearly state your *hypothesis*, the variables investigated, and concisely summarize the methods used.

6. *Define* any abbreviations or specialized terms.
7. Provide a concise *discussion* of the results and findings of other studies so the reader understands the big picture.
8. Describe some of the major *findings* presented in your manuscript and explain how they contribute to the larger field of research.
9. State the principal *conclusions* derived from your results.
10. Identify any *questions* left unanswered and any new questions generated by your study.

Other points to consider when writing your Introduction:

1. Be aware of who will be reading your manuscript and make sure the Introduction is directed to that audience.
2. Move from general to specific: from the problem in the real world to the literature to your research.
3. Write in the present tense except for what you did or found, which should be in the past tense.
4. Be concise.

Twelve Steps to Writing an Effective Results Section

San Francisco Edit

www.sffedit.net

The purpose of a Results section is to present the *key* results of your research without interpreting their meaning. It cannot be combined with the Discussion section unless the journal combines the Results and Discussion into one section. The results should be presented in an orderly sequence, using an outline as a guide for writing and following the sequence of the Methods section upon which the results are based. For every result there must be a method in the Methods section. It is important to carefully plan the tables and figures to ensure that their sequencing tells a story. If you need help in preparing an outline see our article *Eight Steps to Developing an Effective Manuscript Outline* at <http://www.sffedit.net/newsletters.htm>.

1. Determine which results to present by deciding which are relevant to the question(s) presented in the Introduction irrespective of whether or not the results support the hypothesis(es). The Results section does not need to include every result you obtained or observed.
2. Organize the data in the Results section in either chronological order according to the Methods or in order of most to least important. Within each paragraph, the order of most to least important results should be followed.
3. Determine whether the data are best presented in the form of text, figures, graphs, or tables.
4. Summarize your findings and point the reader to the relevant data in the text, figures and/or tables. The text should complement the figures or tables, not repeat the same information.
5. Describe the results and data of the controls and include observations not presented in a formal figure or table, if appropriate.
6. Provide a clear description of the magnitude of a response or difference. If appropriate, use percentage of change rather than exact data.
7. Make sure that the data are accurate and consistent throughout the manuscript.
8. Summarize the statistical analysis and report actual P values for all primary analyses.

9. Use the past tense when you refer to your results.
10. Number figures and tables consecutively in the same sequence they are first mentioned in the text. Depending on the journal, they should be in order at the end of the report after the References, or located appropriately within the text of your results section.
11. Provide a heading for each figure and table. Depending on the journal the table titles and figure legends should be listed separately or located above the table or below the figure. Each figure and table must be sufficiently complete that it could stand on its own, separate from the text.
12. Write with accuracy, brevity and clarity.

Fourteen Steps to Writing an Effective Discussion Section

San Francisco Edit

www.sffedit.net

The purpose of the Discussion is to state your interpretations and opinions, explain the implications of your findings, and make suggestions for future research. Its main function is to answer the questions posed in the Introduction, explain how the results support the answers and, how the answers fit in with existing knowledge on the topic. The Discussion is considered the heart of the paper and usually requires several writing attempts.

The organization of the Discussion is important. Before beginning you should try to develop an outline to organize your thoughts in a logical form. You can use a cluster map, an issue tree, numbering, or some other organizational structure. The steps listed below are intended to help you organize your thoughts. If you need additional help see our articles *Eight Steps to Developing an Effective Manuscript Outline* and *Twelve Steps to Developing an Effective First Draft of your Manuscript* at www.sffedit.net/newsletters.htm.

To make your message clear, the discussion should be kept as short as possible while clearly and fully stating, supporting, explaining, and defending your answers and discussing other important and directly relevant issues. Care must be taken to provide a commentary and not a reiteration of the results. Side issues should not be included, as these tend to obscure the message. No paper is perfect; the key is to help the reader determine what can be positively learned and what is more speculative.

1. Organize the Discussion from the specific to the general: your findings to the literature, to theory, to practice.
2. Use the same key terms, the same verb tense (present tense), and the same point of view that you used when posing the questions in the Introduction.
3. Begin by re-stating the hypothesis you were testing and answering the questions posed in the introduction.
4. Support the answers with the results. Explain how your results relate to expectations and to the literature, clearly stating why they are acceptable and how they are consistent or fit in with previously published knowledge on the topic.

5. Address all the results relating to the questions, regardless of whether or not the findings were statistically significant.
6. Describe the patterns, principles, and relationships shown by each major finding/result and put them in perspective. The sequencing of providing this information is important; first state the answer, then the relevant results, then cite the work of others. If necessary, point the reader to a figure or table to enhance the “story”.
7. Defend your answers, if necessary, by explaining both why your answer is satisfactory and why others are not. Only by giving both sides to the argument can you make your explanation convincing.
8. Discuss and evaluate conflicting explanations of the results. This is the sign of a good discussion.
9. Discuss any unexpected findings. When discussing an unexpected finding, begin the paragraph with the finding and then describe it.
10. Identify potential limitations and weaknesses and comment on the relative importance of these to your interpretation of the results and how they may affect the validity of the findings. When identifying limitations and weaknesses, avoid using an apologetic tone.
11. Summarize concisely the principal implications of the findings, regardless of statistical significance.
12. Provide recommendations (no more than two) for further research. Do not offer suggestions which could have been easily addressed within the study, as this shows there has been inadequate examination and interpretation of the data.
13. Explain how the results and conclusions of this study are important and how they influence our knowledge or understanding of the problem being examined.
14. In your writing of the Discussion, discuss everything, but be concise, brief, and specific.

Twelve Steps to Writing an Effective Materials and Methods

San Francisco Edit

www.sffedit.net

In the Materials and Methods section you explain *clearly* how you conducted your study in order to: (1) enable readers to evaluate the work performed and (2) permit others to replicate your study.

You must describe exactly what you did: what and how experiments were run, what, how much, how often, where, when, and why equipment and materials were used. The main consideration is to ensure that enough detail is provided to verify your findings and to enable the replication of the study.

You should maintain a balance between brevity (you cannot describe every technical issue) and completeness (you need to give adequate detail so that readers know what happened).

This should be the easiest section to write. If you need help beginning, please read our article *Twelve Steps in Developing an Effective First Draft* at <http://www.sffedit.net/newsletters.htm>.

Since each journal has different requirements, review the journal's guidelines before beginning to write this section. The steps listed here are a general compilation of these requirements.

1. Order your procedures chronologically or by type of procedure and then chronologically within type of procedure using sub-headings, where appropriate, to clarify what you did. It is up to you to decide what order of presentation will make the most sense to your reader.
2. Use the past tense and the third person to describe what you did. For example: "The sample was incubated at 37°C for 3 days." - NOT: "I incubate the sample at 37°C for 3 days."
3. Describe your experimental design clearly, including the hypotheses you tested, variables measured, how many replicates you had, controls, treatments, etc.
4. Explain why each procedure was done. Reference may be made to a published paper as an alternative to describing a lengthy procedure.

5. Identify the source of any specific type of equipment, a specific enzyme, organism, or a culture from a particular supplier, which is critical to the success of the experiment.
6. Describe in detail any modifications to equipment or equipment constructed specifically for the study and, if pertinent, provide illustrations of the modifications.
7. Precisely quantify measurements (all metric) and include errors of measurement.
8. Describe the dates and the site where your field study was conducted including physical and biological characteristics of the site, if pertinent to the study's objectives.
9. Identify treatments using the variable or treatment name, rather than an ambiguous, generic name or number (e.g., use "healthy donors" rather than "group 1").
10. If required by the journal, mention the approval for the study by the relevant ethics committee(s) and the informed consent of the subjects.
11. Describe statistical tests and the comparisons made; ordinary statistical methods should be used without comment; advanced or unusual methods may require a literature citation.
12. Show your Materials and Methods section to a colleague and ask whether they would have difficulty in repeating your study.

Other points to consider when writing the Materials and Methods:

1. Don't mix results with procedures.
2. Omit all explanatory information and background - save it for the discussion.
3. Don't include information that is irrelevant to the reader, such as what color ice bucket you used, or which individual logged in the data.

Twelve Steps to Developing Effective Tables and Figures

San Francisco Edit

www.sfcedit.net

The purpose of tables and figures is to report data too numerous or complicated to be described adequately in the text and/or to reveal trends or patterns in the data. Tables and figures are critical. If readers go beyond the abstract, they are likely to examine the tables and figures next.

Before writing the first draft of your manuscript, it is important to organize the data you plan to present in the manuscript. By preparing the tables and figures, their titles and legends, and appropriate statistical analyses, you will be certain of your results before you need to interpret them. At this time you will also be able to determine if you have all the data you need. Before writing the first draft, it is important to plan which results answer the questions you posed in your research and which data can be left out.

If you need help beginning, please read our article *Twelve Steps in Developing an Effective First Draft* at <http://www.sfcedit.net/newsletters.htm>.

1. Decide which results to present, paying attention to whether data are best presented within the text or as tables or figures.
2. Limit the number of tables and figures to those that provide essential information that could not adequately be presented in the text.
3. Include only results which are relevant to the question(s) posed in the introduction, irrespective of whether or not the results support the hypothesis(es).
4. Design each table and figure to be understandable on its own, without reference to the text.
5. Number each figure and table in the order in which they are referred to in the text (figures and tables are numbered separately).
6. Organize the tables and figures in such an order that they tell a story.
7. Check with the targeted journal, but typically tables and figures are located on separate pages that follow the Reference section.

8. Make sure there is no page break in the middle of a table or figure, if the journal wants the tables and figures integrated into the text. Do not wrap text around tables and figures.
9. Be sure all figures and tables are referenced in the text of the article.
10. Obtain permission from the copyright holder (usually the publisher) and acknowledge the source, if you are including a table or figure that has already been published.
11. Write the table titles and figure legends in the past tense.
12. Provide information regarding what is presented in the table or figure in the table titles and figure legends, but not a summary or interpretation of the results.

Tables

Tables are used to make an article more readable by removing numeric data from the text. Tables can also be used to synthesize existing literature, to explain variables, or to present the wording of survey questions.

1. Create tables with the table function (pull down menu) in Microsoft Word. Do not use tabs.
2. Use column headings and table notes accurately to simplify and clarify the table. In most cases, the meaning of each column should be apparent without reference to the text.
3. Check with the journal, but most journals want the table title and table on the same page, with each table on a separate page in numerical order.

Figures

Figures provide visual impact and therefore they are often the best way to communicate the primary finding. Figures are traditionally used to display trends and group results but can also be used effectively to communicate processes or to display detailed data simply.

1. Label each axis including units of measurement and clearly identify the data you are displaying (e.g. label each line in a graph).
2. Check with the journal, but most want the figure legends listed in numerical order on a separate page and each figure on a separate page in numerical order.

3. Figures should be of high image quality, with minimal pixelization. Check with the journal on which image file type they prefer.
4. Figures are usually in black and white. Color is extremely expensive to publish, and should only be used when it provides unique information.
5. Do not include experimental details in the legend; these details should be included in the methods section.
6. Photographs of subjects should be used only if written, informed consent was obtained prior to the taking of the photograph.
7. Choose the correct figure format: 1) if independent and dependent variables are numeric, line diagrams or scattergrams, 2) if only the dependent variable is numeric, bar graphs, 3) for proportions, bar graphs or pie charts.