LECTURE NOTES

ON

ENGLISH FOR RESEARCH PAPER WRITING

Regulation: IARE-R18

M.TECH I Year I Semester

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PLANNING AND PREPARATION

You will be more motivated to write a good paper, if you have thought about exactly why you want to have your research published. One of your reasons will probably be because you believe you can make a contribution to a gap in the current knowledge base of your field. It helps if you can write down concisely what this contribution is, and then double check that your proposed contribution really is original.

So, before you start writing you need to have an absolutely clear idea of:

- What your research goal was
- What your most important findings are and how you can demonstrate that they are true
- How these findings differ from, and add to, previous knowledge

You know implicitly what the importance of your findings are – after all, you may have been working for months and years on the project.

But the reader does not know.

You must give the reader a clear message.

Discussing and presenting your findings to colleagues should help you to identify what your key findings are.

Make a list of your key findings and choose the most important ones to fit the space you have available (i.e. the total word count allowed by your chosen journal). For each key finding decide if there is another possible explanation for what you have found. You can do this by looking in the literature again. Make sure you have not inserted any bias in your explanation of your findings. Next, write an explanation saying why you think each key finding is true. However, write your explanation in a way that shows you are open to other interpretations.

The above suggestions should also help you to decide whether your planned paper really will have a contribution to make.

Which journal should I choose?

If you have never written a paper before and your supervisor has not indicated a specific journal where he/she would like you to publish, it is a good idea to ask colleagues in your research group what they read and what sort of publications they aspire to publish in.

Even if you are writing a paper for the first time, it does not mean that it will only be suitable

for a marginal or not very well known journal. Your progress in academia very much depends on your ability to publish in journals that have a high impact factor.

An impact factor is a measure of how prestigious a journal is. The higher the impact factor, the more widely read the journal is, and the more likely other researchers will cite your paper. Tables of impact factors which rank all the peer-reviewed journals in the world are available on the Net, you can use Google Scholar to help you find them.

However, given the difficulties of getting published in a high impact journal, you might consider opting for a short article or a 'letter'. A literature review or a methodological text is often publishable. For instance, if you are studying medicine, you could consider writing a clinical review – a 2,500 word article which is essentially a review of the management of important and common problems. Many disciplines have such an equivalent.

When you have chosen three or four possible journals, look at their styles and think about their audience – what do the editors and readers expect from the articles.

You could try to insert your paper into an ongoing discussion that is currently being covered in the journal. This approach may increase the chances of getting your paper approved by the editor.

The topic you choose to write about is obviously related to the journal where you want to publish. Occasionally it may be worth choosing the journal first (rather than your exact topic), and then deciding which angle of your research to focus on so that it will match the expectations of your chosen journal.

Note there are many online journals that advertise their services by sending emails to unsuspecting researchers – do not submit to such journals as either they are scams or at the very best have no impact factor.

How can I know exactly what the editor is looking for?

Read as many papers as you can from your chosen journal. This should help you to gain a clearer picture of what the editors of the journal are looking for to enable them to keep their readership levels high. Below are some of the typical things that editors hope to find in manuscripts.

Sometimes journals have themed or special issues on specific topics. These special issues are announced many months in advance of publication. Keep a look out for an issue that covers your specific area – it may be the perfect opportunity for you.

What preparation do I need to do?

Once you have chosen your journal, look at the most frequently cited papers to see how the authors rationalize the various steps of their research. Try to use papers that you will probably quote in your section on the review of the literature, and which are highly relevant to your

topic and/or classic papers in your general field.

For example, you could create a table with some or all of the following headings:

- Problem that the research addresses
- Background information and relevant references
- Elements that validate the level of innovation of the research
- Conceptual model, methodology or procedure that the research takes into consideration
- Materials, equipment and software used
- Method used and the operational steps that the author carried out
- Results achieved
- Analysis and interpretation of these results
- Strengths and weaknesses of the research, the insights demonstrated
- Implications for further research

Then you can fill in your table with brief notes for each of the papers you have Ana- lazed. This analysis should help you to:

1. Write your own literature review, because after this analysis you will be very familiar with the literature
2. Identify the differences in other researchers' approaches and results compared to your research
3. Note down the strengths and weaknesses (including possible bias) in the work of others

These three points should enable you to understand in what ways your research is unique, innovative, interesting and useful, and how it extends what is already in the literature. Your aim is to find a knowledge gap to fill.

If you have done a very thorough literature search, then another publishing opportunity for you is to write a literature review.

How can I create a template?

Choose one paper that is close to your topic, that is written by a native English speaker, and that you enjoyed reading. Use this paper as a model into which you can 'paste' your own research.

Notice how your model paper is structured:

- How does the author begin?
- What points does s/he make in each section?
- How does s/he link paragraphs together?
- How does s/he connect the Results with the Discussion?
- How does s/he present the Conclusions?

As you read your model paper, note down some useful English phrases that the author uses. Such phrases will help to increase the readability of your text, as they will be familiar to your readers.

In what order should I write the various sections?

There is no standard order in which you should write the various sections of your paper. You should choose the order that suits you best. This may involve writing several sections simultaneously.

Many authors start with the Methods, which is often the easiest section to write because this is the part that will usually be clearest in your mind. Beginning with the Methods will also give you the confidence and impetus you need to move on to the other sections of the paper.

In reality, it is best to start with the Abstract as this will help you to focus / orient your ideas on what are the key aspects of your research. In any case, if you are going to present your work at a conference, the organizers will ask you to submit an abstract before you write the related paper – you can still change the Abstract when you have finished writing the actual paper.

You might find it useful to look at the scientific study protocol that you wrote when you outlined the aims of your research at the beginning of your PhD or before you began your current project. Here you should have written out your goals very clearly, and this will help you to write your Abstract.

The hardest part for most authors is the Discussion where you have to interpret your results and compare them with other authors' results. While you are writing the Discussion, you may find it useful to draft the Introduction, as some of the authors you mention will appear both in the Introduction and the Discussion.

A typical order for writing the various sections is thus:

Abstract (very rough draft)
Methods

Results
Discussion
Introduction
Conclusions
Abstract (final version)

It is a good idea to write the Results and Discussion before the Introduction. This is because you will only truly understand the significance of what you have done after you have written these two sections. Laying the background foundations on which you can highlight the significance of your research is a major part of the Introduction.

Write directly in English rather than in your native language. This may be hard at the beginning. But with a model paper written by a native English-speaker in front of you, which you can follow step by step, it should be quicker than translating from your own language. From an English point of view, it should also be more reliable and accurate because you will be using some standard phrases that you have lifted directly or adapted from your model English paper.

Some researchers find it much easier to write a paper if they have already written notes in English throughout the research project. This means that you will already have much of the content you need when you finally start writing your manuscript. It also means that you will get a lot of practice in writing in English and may help you to discover any gaps in your understanding of your topic.

It might also be worth finding a native speaker to correct your written English for you whenever you write notes during the research. This might be a useful alternative to following a general English language course as it will be much more focused and also tailored to your particular needs. However, if your department or institute offers writing courses these are obviously well worth attending.

With your colleagues you could set up a writing group within your academic department. This would enable you to practice your own English writing skills and evaluate those of others in a mutual learning process.

One way of improving your writing skills and raising your profile in your area of expertise is to consider writing letters. Journals generally publish letters that offer a short critical review of the research of others. Such letters tend to be about 300 words long, so the same as or a little longer than an abstract. You can also write online rapid responses to letters in print journals.

How do I know what style and structure to use?

Each journal has its own requirements and style guide. These instructions tend to have different titles, for example: ‘instructions for authors’, ‘notes for authors’, ‘author guidelines’. They often appear under a page called ‘author resources’.

The guidelines include:

- Types of titles that are acceptable
- Structure of paper – for example, is the review of the literature near the beginning of the article or at the end? Are the Results included in the Discussion or in a separate section? Is there a Conclusions section?
- Layout (including how the Abstract should be presented – one long paragraph, or 5–6 short paragraphs)
- Structure of sections – some journals prescribe exactly how certain sections (most commonly the Discussion) are organized, and what subheadings should be included
- Use of passive rather than personal style (we, I)
- How to make citations
- How to arrange the bibliography
- Use of key words
- American or British spelling

It is vital that you rigorously follow your chosen journal's instructions to authors. So download these instructions from the journal's website before you start writing.

If you opt for a low impact journal, you will still find it very useful to look at the instructions of an equivalent high impact journal. Higher impact journals tend to have better author resources, which are useful for all authors, not just for those in the specific field of the journal itself.

If no journals in your discipline offer such resources, then I suggest that you look at the 'Welcome to resources for authors' page of the website of the British Medical Journal (bmj.com), one of the world's most prestigious journals. Even if you are not a medical researcher, the resources you will find there are very helpful.

The medical community has made a concerted effort to improve the quality of papers published in its journals. So reading one or two medical papers could help you learn techniques for clear structure and clear concise writing.

How can I highlight my key findings?

While you are planning what to put in each section, think of where and how you can highlight your contribution. It may help you to imagine that the reader has asked you these questions:

1. What problem are you trying to solve / investigate?

2. How did you solve / investigate it?
3. How do your solution / investigation differ from previous approaches?
4. What did you discover?
5. How do your findings differ from what is already in the literature, and what do they mean?

Readers generally read the Title and Abstract of a paper first, followed by the Discussion; though some may just look at your figures and tables! However, you cannot be sure at which section your readers will begin reading, so they need access to the answers to these questions in most or all the sections. Look at other papers in your chosen journal to see how the authors deal with such questions. Clearly, the emphasis you put on answering the questions will vary from section to section, and is likely to be greatest in the Abstract and Discussion, but consider covering it in the other sections too.

When you revise your paper if you think you have done too much highlighting, then you can always remove a few sentences. But while drafting your paper if you constantly try to highlight your contribution, this will give you extra focus.

Think of your paper as a product that you are trying to sell to the referee and journal. The clearer and more convincing you are, the more likely a journal will 'buy' your manuscript.

What kind of culture do you come from? Is there a power distance between you and your professors? Do your professors expect you to listen and understand by yourself what they are saying? Do they write in a way that requires effort on your part to decipher what they are saying? If so, you are in the majority on a worldwide scale. You are part of a receiver-oriented culture. It is your job, rather than the speaker's or writer's, to make sense of what you hear and read.

Anglo cultures too were once like this. But in the last 50 years or so, the roles have been reversed. It is the responsibility of the speaker or writer to ensure that their audience understands what they are saying.

Your job in your paper is to make the reader's understanding of your paper as simple and effortless as possible.
When writing your paper bears the following in mind:

(1) A referee has no obligation to review your paper

Referees review manuscripts in their own time and have no direct financial reward for doing so. So do everything you can to make the referee's work easier and more pleasurable – clear English, clear layout, clear tables etc. By doing so you will increase the chances of your paper being accepted.

(2) Write in a way that a non-expert or less experienced person can understand

Research is becoming increasingly more specialized, so that even two people with the

same degree may not be able to understand each other's papers. Also, due to the fact that research groups cannot always get the funding they need for research in their specific field, they may have to shift their interests to a related field where funds are available. This entails them reading the literature from this new field. The clearer the literature is, the more they will understand.

This means that when you begin the writing process, you need to bear in mind that your reader may not be as expert as you are.

(3) Make your paper interesting enough for an expert

Try to ensure that your paper has enough meat (i.e. scientific substance) for the experts. This does not mean you have to write in a more complicated way, but just that you include enough details to get experts interested.

(4) Look at the forms used in referees' reports

Every journal has a standard form for use by referees when writing their reports, which the editor then uses to judge whether your paper is suitable for publication or not. Through your professor and colleagues, try to find as many such forms as you can, and preferably the one for your chosen journal.

You can use the questions in the forms as guidelines for your writing. Here are some examples:

- Is the research novel and of international relevance?
- Does the article fit the aims and scope of the journal?
- Is the paper written grammatically and clearly?
- Is the writing style succinct and appropriate to the work?
- Is the title appropriate to the content?
- Does the abstract accurately describe the content?
- Are the conclusions borne out by the evidence and arguments?

It will help you considerably if you think about all these questions while you are writing your paper. Also, when you have finished, you should check that the answer to each question is 'yes'.

A study carried out by James Evans, a sociologist at the University of Chicago, revealed that despite the fact more papers are available online than ever before (due to the digitization of older articles), it tends to be the most recent papers that are cited … again and again.

Search engines determine what we are likely to read. Our tendency is to click on what is presented to us on the first few pages of what the search engine returns. This narrows the scope of what we read and exaggerates in a self-perpetuating manner the importance of the articles that are ranked higher in the search.

This has implications for the way you approach the writing of your paper:

- Key words are essential in order for the search engines to identify your paper
- No amount of key words is going to help you if readers are not immediately able to understand your paper, and cite it in their own.

Basic word order in English: subject + verb + object + indirect object

The order in which you put information in a sentence (or paragraph) conditions the weight that your reader will give to each element of information.

Native English-speaking readers have a clear expectation regarding the order in which information should be given to them.

English has a strict order in which words can appear in a sentence. Below is an example of this order.

The researchers sent their manuscript to the journal.

This order is rarely altered. It is:

- subject (the researchers)
- Verb (sent)
- Direct object (their manuscript)
- Indirect object (the journal)

The key is to keep the subject, verb, direct object and indirect object as close to each other as possible:.

Last week the researchers sent their manuscript to the journal for the second time.

The sentence below does not follow the correct order:

*The researchers last week sent for the second time to the journal their manuscript.

The position of last week and for the second time is wrong, and the indirect object comes

before the direct object.

Readers expect words/phrases that are closely related to each other, to appear next to each other within the sentence.

In the NO! Versions of the first two examples, the information in italics is key to the readers' overall understanding and should be placed earlier in the sentence closer to the elements it refers to. In the third example, the YES version avoids the need to break up the flow of the sentence. In the last example, the verb in the NO! Version is almost at the end of the sentence - this is extremely rare in English and should be avoided.

Below are some more examples:

Place the subject before the verb

The subject (in italics in the sentences below) must come before the verb.

The key rule is: Say what something is before you begin to describe it.

In the NO! Versions below, the authors have delayed the subject until the end of the clause. They have used an introductory subsidiary clause to stress the importance or evidence of the subject before telling the reader what the subject is.

A verb can come before a noun, if the verb is in the imperative, or if the sentence begins with there + to be.

The verb in the infinitive form is also found at the beginning of a phrase:

Don't delay the subject

As mentioned in the Factoids, when we scan results from a search engine, our eye rapidly goes vertically down the left-hand side of the page, before starting again to read horizontally.

This means that you need to think carefully about what information to place at the beginning of the first sentence that begins a new paragraph. If you misplace the key information, there is a strong chance that browsers and readers won't spot it.

In the following sentences, the parts highlighted in italics occupy the key left-hand position. They delay the subject, with the risk that readers may not even see the subject.

S1. It is interesting to note that x is equal to y.
S2. As a consequence of the preceding observations, x is equal to y.

To avoid this problem:

- delete or reduce the part before the subject

- Shift the linking expression to later in the sentence S1 and S2 thus become:
  Note that x is equal to y. // interestingly, x is equal to y.

Consequently, x is equal to y. // X is thus equal to Y.

Putting it in first position (S1) often delays the real subject. Instead, use modal verbs (might, need, should etc.) where possible.

The verb contains important information: keep it as close as possible to the subject. Anything that comes between the subject and the verb will be read with less attention, and readers will consider it of less importance (see next subsection).

S1 and S2 force the reader to wait too long to find out what the verb is and thus delay important information.

S1. *A gradual decline in germ inability and vigor of the resultant seedling, a higher sensitivity to stresses upon germination, and possibly a loss of the ability to germinate are recorded in the literature.
S2. *People with a high rate of intelligence, an unusual ability to resolve problems, a passion for computers, along with good communication skills are generally employed by such companies.

S3 and S4 shift the verb to the beginning of the sentence and make the meaning / direction of the sentence immediately clear.

S3. There is generally a gradual decline in germ inability and of the resultant seedling, followed by a higher sensitivity to stress upon germination, and possibly a loss of the ability to germinate.
S4. Such companies generally employ people with a high rate of…

S3 and S4 use active verbs. But sometimes you may need to use the passive and you may have several subjects for the same verb. In such cases, locate the passive verb after the first subject (S5):

S5. People with a high rate of intelligence are generally employed by such companies. They must also have other skills including: an unusual ability to…

If you insert more than a couple of words between the subject and the verb, this may interrupt the reader's train of thought. Readers may consider this parenthetical information to be of less importance.

Sentences are much easier to read if they flow logically from step to step, without any deviations.

This does not mean that you cannot have a series of short clauses within one sentence. In the example below, readers do not have to change their perspective while moving from one clause to the next.

In Old English, the language spoken in English over 1000 years ago, a word could be placed almost anywhere in a sentence, and often with no change in meaning.

Of course, the rule not to insert parenthetical information, like every rule, should not be regarded as sacrosanct - i.e. you are at liberty to break it. If you think that the insertion makes the sentence flow better and be clearer, then ignore the rule.

Don't separate the verb from its direct object

When a verb is followed by two possible objects, place the direct object (i.e. the thing given or received) before the indirect object (the thing it is given to or received by).

This kind of construction is often found with verbs followed by 'to' and 'with': associate X with Y, apply X to Y, attribute X to Y, consign X to Y, give X to Y (or give Y X), introduce X to Y, send X to Y (or send Y X).

In S1 below, the direct object is very long and consists of a series of items, so the reader has to wait a long time before discovering what all these items are associated with. The solution, S2, is to put the indirect object after the first item and then use 'along with'. S3 and S4 are other alternatives to dealing with this problem.

S1. *We can associate a high cost, higher overheads, a significant increase in man-hours and several other problems with these values.
S2. We can associate a high cost with these values, along with higher overheads, a significant increase in man-hours and several other problems.
S3. We can associate several factors with these values: a high cost, higher overheads, a significant increase in man-hours and several other problems.
S4. The following can be associated with these values:

- A high cost
- Higher overheads
- A significant increase in man hours

Put the direct object before the indirect object

Don't put the indirect object (in italics) at the beginning of the sentence or main clause. This is not the usual word order in English.

Doesn't use a pronoun (it, they) before you introduce the noun that the pronoun refers to?

It is OK to use a pronoun at the beginning of the sentence, provided that this pro- noun refers back to a noun in a previous sentence (i.e. a backward reference). For example:

S1. Beeswax is a very important substance because… In fact, it is…

In S1 it is clear that it refers to beeswax. But in S2, below, it refers to a noun that comes after (i.e. a forward reference). The reader does not know what the pronoun refers to and thus has to wait to find out.

S2. *Although it is a very stable and chemically inert material, studies have verified that the composition of beeswax is …

A better version is S3, which immediately tells the reader what the subject is.

S3. Although beeswax is a very stable and chemically inert material, studies have verified that its composition is …

Locate negations near the beginning of the sentence

The order you put the words in your sentence should be designed to take your reader through a logical progression of thoughts. These thoughts should move forward, never backtracking, never forcing the reader to reconsider or reinterpret what they have just read in the light of what they are reading now.

In S1 and S2 readers cannot predict how the sentence might progress. They are forced to wait to the end before being able to understand what they have just read.

S1. * Data regarding the thyroid function and the thyroid antibodies before the beginning of the therapy were not available.
S2. * All of the spectra of the volatiles did not show absorptions in the range …

Both S1 and S2 appear to begin in a positive way and then suddenly change direction.

Instead, S3 and S4 help the reader to immediately understand the central purpose and driving force of the sentence (also known as the ‘thrust of a sentence’).

S3. No data were available regarding thyroid function and thyroid antibodies before the beginning of the therapy. // before the beginning of the therapy, no data were available regarding …
S4. None of the spectra of the volatiles showed absorptions in the range …

Negations (no, do not, does not, none, nothing etc.) are often a key element in the thrust of a sentence - try to locate them as close as possible to the beginning of a sentence.

Below are some more examples:

As highlighted in the first two NO! Examples, English tends to express negative ideas with a negation. This helps the reader to understand immediately that something negative is being said. The last example is incorrect English because the verb and the negation (not) have been separated.

The word not should be placed before the main verb it is associated with. In S1 not is placed after the verb and is thus incorrect.
S1. * Patients seemed not to be affected by intestinal disorders.
S2. Patients did not seem to be affected by intestinal disorders.

When the verbs to have and to be are used in the present simple or past simple, not
Is located after the verb.

S3. These findings are not significant.
S4. Their results had no value. // their results did not have any value.

Not is located after modal verbs and auxiliary verbs.

S5. Such patients should not be treated with warfarin.
S6. We have not encountered such a problem before.

State your aim before giving the reasons for it

When you explain a new game to someone, do you tell them the rules/strategies and then the objective, or vice versa? Which sounds more logical to you: S1 or S2?

S1. You need to develop a strategy, make decisions as to whether to collaborate or not with the other players, also keep an eye on the progress of the other players, and finally make the most money in order to win the game.
S2. In order to win the game you need to make the most money. To do this, you need to develop …

Game players and readers have the same expectations: they want to know the aim of the game before learning how to carry it out - i) aim ii) means (i.e. how).

In S1 you are forcing the reader to wait for the key information, which only appears 38 words into the sentence. In S2 the aim is immediately established.

However, if the sentence is short, it does not make too much difference which element (aim or means) you put first. So both S3 and S4 could be used.

Deciding where to locate an adverb

The rules for deciding where to locate an adverb are complex. This section only gives some very basic guidelines.

If you are in doubt about where to put the adverb, the following rules apply to most adverbs including only and also. Locate the adverb:

- Immediately before the main verb.

  Dying neurons do not usually exhibit these biochemical changes. The mental functions are slowed, and patients are also confused.

- Immediately before the second auxiliary when there are two auxiliaries.

  Language would never have arisen as a set of bare arbitrary terms if … Late complications may not always have been notified.

- After the present and past tenses of 'to be'

  The answer of the machine is thus correct.

However other types of adverbs (e.g. certainty, manner, time) follow different rules.
Adjectives normally go before the noun they describe.

If you want to put the adjective after the noun, you have to use a relative clause as in the second alternatives in the Yes column above

Never put an adjective before a noun that it does not describe. Generally, you cannot put an adjective between two nouns.

Avoid creating strings of nouns that describe other nouns

You cannot indiscriminately put nouns in front of each other in a string. For example, you cannot say art state technology (state-of-the-art technology) or mass destruction weapons (weapons of mass destruction). But you can say a software program or an aluminum tube.

Native speakers do tend to string nouns together, but they intuitively know how to do it. In fact, they are not following any written rules, but they base themselves on examples that already exist. If you are a non-native speaker I strongly recommend that you verify on Google Scholar that your proposed string of nouns already exists and has been used by native English-speaking authors.

If it does not exist, it will sound very strange to any native English-speaking referees, and more than one occurrence of such structures could cause the referee to recommend that your English be revised.

If it has not been used by native English-speaking authors, then you need to change the order of the words, which normally entails inserting some prepositions.

Summary

- ➢ Basic English word order is: (1) subject, (2) verb, (3) direct object, (4) indirect object. Keep these four elements in this order and as close to each other as possible.

- ➢ If you have a choice of subjects, choose the one that is the most relevant and leads to the shortest construction.

- ➢ Avoid delaying the subject. So don't begin a sentence with the impersonal it.

- ➢ Avoid inserting parenthetical information between the subject and the verb.

- ➢ Most adverbs are located just before the main verb, and before the second aux- iliary verb when there are two auxiliaries.

- ➢ Put adjectives before the noun they describe, or use a relative clause. Do not insert an adjective between two nouns or before the wrong noun.

- ➢ Do not indiscriminately put nouns in a string.

Rules tend to have exceptions. The rules given in this section also have exceptions, and so you might find sentences written by native English speakers that contradict my rules.

Readers do not necessarily read the paper from beginning to end. They may begin with any section in the paper.

This means you could consider starting some sections (e.g. Introduction, Discussion, Conclusions) with a one or two-sentence summary of the main aims and/or findings of the paper. This style is also typical if you are writing chapters in a book.

However, check the general style of papers in your chosen journal. If they do not begin sections in such a way, then don't do it yourself. Instead go for a more direct approach.

Here are some examples of mini summaries at the beginning of a section:

The X Committee has for some years encouraged collaborative clinical trials in X by reporting the results in the medical literature. In this section we describe the first of two unreported results that we believe deserve such publication and which constitute the main contribution of this paper.

As mentioned in the Introduction, a principal concern in the field of X is to understand why… This section attempts to answer the question…

Our aim is to provide a simple alternative to the complex theoretical models that attempt to explain… In this section we present a simplified model, which we believe is…

This section reviews the process of… This process provides the backbone to the system that is at the core of our research.

In addition to this mini summary, some authors also briefly outline what will be contained in the rest of the section. Here are four examples:

S1. In this section, we briefly review the broad perspectives that have shaped the direction of thinking about …
S2. In this section, the numerous advances in cosmology are described, with emphasis on the vast new area of …

S3. In this section, we will ask the question: 'Under what circumstances will a paper be rejected?'
S4. In this section we define our approach and show how it can be very naturally used to define distributions over functions. In the following section we show how this distribution is …

The examples highlight different styles for introducing the topic. S1 and S2 are the standard approach, using a personal style (we in S1) and an impersonal style (the passive form in S2). S3 represents a variation because it asks a question – this may be a good solution for creating some variety in the way you begin each section.

Note how in S4 the author also refers to future sections. Such references help the reader to see how the current section fits in with the logical progression of the rest of the paper. However, you should keep such references as short as possible as they can become quite heavy and annoying for the reader.

In any case, readers often don't have the time or the inclination to read them. In such cases you need a more direct approach.

Being direct does not necessarily entail telling the reader what you did, but telling them what it means. A typical sentence to open the Results section is:

S1. An analysis of the number of words used in English with respect to Italian, showed that the average sentence in English was 25 words long, whereas in Italian it was 32 words long

A much more direct approach is to say:

S2. Italian tends to use more words per sentence than English, so when an Italian document is translated into English, there is …

S2 begins with the main information, and then provides the implications. You do not necessarily need to tell the reader the exact details of what you did (this would be more appropriate in Methods) but just what you found.

Clear English requires that you put the subject at the beginning of the sentence. Generally you

will have a choice of possible subjects.

X was elicited by Y.

Y elicited X.

In the simple example above, your choice will depend on whether you want to emphasize X or Y. The one you want to emphasize should be put as the subject.

As readers, we tend to focus on the areas of a sentence that come immediately before and after a full stop. This is because there is extra white space between one sentence and another, which acts as a restful pause for the eye. Our eyes are also drawn to the capital letter that begins each sentence. These are the moments where you potentially have the reader's attention, so don't waste them.

If the first few words routinely contain no useful or new information, then it becomes very tedious.

So the best solution is to shift 'no value added' phrases to later on in the sentence and preferably reduce them to one word. Otherwise you are encouraging readers to skim i.e. to read very fast and skip words, sentences and even whole paragraphs and sections.

The sentences below contain exactly the same information, but the grammatical subjects are different:

S1. Particularly interesting for researchers in physics is the new feature, named X, for calculate velocity.
S2. Physics now has a new feature, named X, for calculating velocity.
S3. Velocity can now be calculated with a new feature, named X, which is particularly interesting for physicists.
S4. X is a new feature for calculating velocity. It is particularly interesting for physicists.

When deciding what the subject is for the first sentence in a paragraph, it is generally best to choose the most recent or newest information. S1 and S2 refer to known situations – physics, and physicists – they do not give any new information, so they are not well-constructed sentences.

S3 also begins with a known, in this case velocity. This is fine if velocity is the main focus. However, given that velocity is a common factor for physicists, then S4 may be the best solution as it begins with completely new information. The choice between S3 and S4 will depend on where the author wants to put the focus.

In summary, put the key element to your 'story' in the first position (also known as the 'topic position') of a new paragraph.

However, within a paragraph it may make sense to put the old information (i.e. info mentioned

earlier in the paragraph) in the topic position. This enables you to link sentences together so that the reader understands that info given in a previous sentence is now being further defined in a new sentence.

S1 and S2 begin with the same subject English, which is the main topic of the sentence. They then present the same two pieces of information, but in a different order.

S1. English, which is the international language of communication, is now studied by 1.1 billion people.
S2. *English, which is now studied by 1.1 billion people, is the international language of communication.

In both cases if you removed the 'which' clause (in italics) the sentence would still make sense. But if you removed the final clause it wouldn't. This would seem to indicate that the final clause is where we locate the most important information. Thus the relative position of the various parts of the phrase tells the reader the relative importance of the information contained on those parts.

In S1, the order of the information tells you that the fact that English is the international language of communication are old news, but that 1.1 billion people is new information that the reader probably does not already know. Thus, the order of the information in S2 is a little strange because it puts the new information (1.1. billion people) before the old information (international language).
Readers tend to focus on the first and last words of a sentence, so avoid placing your most important information in the middle of a long sentence. Readers don't want to make an effort to identify the key points; they want to be told immediately.

Here are some more examples that show how by changing the order of information within a sentence you can achieve a different effect:

S3. English is now studied by 1.1 billion people, though this number is expected to drop with the rise in importance of Chinese.
S4. Although English is now studied by 1.1 billion people, this number is expected to drop with the rise in importance of Chinese.
S5. Although the importance of Chinese is expected to lead to a drop in the numbers of people studying English, 1.1 billion people still study English.

S3–S5 all contain the same information, but the weight that this information is given varies.

In S3 the reader learns some information. This information is then qualified with though, which is used to introduce some new information that the author imagines that the reader does not know.

In S4 the reader is immediately alerted to the fact that the information contained at the beginning of the sentence is going to be qualified by new information in the second part. The order of the information in S4 is thus more logical than in S3.

In S5 the writer assumes that the reader already knows the importance of Chinese and instead focuses on the fact that despite the increase in the number of Chinese speakers, English is still studied by a lot of people. 'still' is the key word and it is located very close to the end of the sentence.

In S1–S5 there are two parts to each sentence, and the writer gives more emphasis to the second part. Sometimes, you may want to give equal weight to the two parts.

S6. English is the international language of communication. It is now studied by 1.1 billion people.
S7. The importance of Chinese is expected to lead to drop in the numbers of people studying English. Despite this, 1.1 billion people still study English.

In S6 and S7, the writer wants the reader to notice and absorb the two pieces of important information separately. She does this by presenting the information in two distinct sentences. This device should not be used too often because it can lead to a series of very short sentences, which after a while begin to sound like a list.

Known information is traditionally placed at the beginning of a sentence or paragraph. Below are the first three sentences from the abstract of a fictitious paper entitled 'Readability and Non-Native English Speakers' intended for a journal dedicated to communication in the world of business.

VERSION I Readability formulas calculate how readable a text is by determining the level of difficulty of each individual word and the length of sentences. All types of writers can use these formulas in order to understand how difficult or readable their texts would be for the average reader. However, readability formulas are based purely on what is considered difficult for a native English speaker, and do not take into account problems that may be encountered by non-natives.

The first word, readability, is one of the author's key words. It immediately alerts the reader to the topic of the sentence and of the abstract (and paper) as a whole. However, the information contained in it is not new – readability formulas and their indexes are well established in the literature on business communication.

The role of the first two sentences is thus to set the context and gently guide the reader into the paragraph. The third sentence then introduces the new element, i.e. the fact that readability indexes do not take into account non-native speakers. The third sentence thus highlights the problem that the paper intends to tackle.

However, the abstract could have begun like this:

VERSION 2 Current readability formulas are based purely on what is considered difficult for a native English speaker. They fail to take into account problems that may be encountered by non-natives. One thousand five hundred PhD students from 10 countries were asked to

evaluate the difficulty of five technical texts from their business discipline written by native English speakers. Three key difficulties were found: unfamiliar vocabulary (typically Anglo-Saxon words), unfamiliar cultural references, and the use of humor. The paper also proposes a new approach to assessing the level of readability of texts to account for such difficulties.

In Version 2, the author still begins with his key word, readability. But he precedes it with current, which signals to the reader that the author will then probably propose an alternative. The author also assumes that his readers will be aware of what a readability formula is, so he feels he doesn't need to mention it. Thus, in the second sentence he immediately underlines a critical problem with current formulas. In the third sentence he then tells his readers what his research was and then what was found.

Version 3, below, contains only new information.

VERSION 3 Unfamiliar vocabulary (typically Anglo-Saxon words), unfamiliar cultural references, and the use of humor: these, according to our survey of 1500 PhD students, are the main difficulties non-native speakers have when reading a business text in English. Our results highlight the need to adjust current readability formulas in order to take non-native speakers into account. The paper also proposes a new approach to assessing the level of readability of texts to account for such difficulties.

This version is designed to immediately attract the reader's attention. In contrast, the first 50 words of Version 1 contain no new information at all. Version 2 has 40–50% new information or more, depending on whether readers are familiar with the limitations of readability formulas with regard to non-natives.

So, which version should you use?

The best version to use depends on two factors:

1. The section of the paper
2. What you are trying to achieve

Version 1 would only be appropriate in an Abstract if the journal where it is being published does not usually deal with communication and / or readability indexes. In this case the readers need the context to be set for them. It might be more acceptable in an Introduction in a slightly more specialized journal. In an Introduction the aim is not principally to attract attention. If readers are reading your Introduction you can presume that you already have their attention.

So the information contained in Version 1 would be used in an Introduction just to remind the readers of the context. This is a very typical way to begin an Introduction – it is what readers expect and therefore it is generally a good technique.

Version 2 would be appropriate as an Abstract or Introduction in a specialized journal on business communication.

Version 3 would only be appropriate in an Abstract and exclusively in a very specialized journal. It can only be used if you have clear findings, or a clear new methodology, to report. It works very well because it does not force readers to read background information that they are probably already familiar with.

You might also choose Version 3 as an Abstract for a congress. In such cases you are competing for the attention of the referees who will use your Abstract to decide whether to include your contribution at the congress. If your Abstract is accepted, you will then be competing with other authors / presenters in motivating the audience to come and watch you rather than a parallel session.

In many languages Versions 2 and 3 would not be acceptable. In the words of one of my Greek PhD students:

New information in Greek comes at the very end. The rule is that first the author gives extensive background information and only at the end he / she introduce the new concept. This is the generally accepted (and considered correct) way of writing.

This means that when you write in English you may be going against what is considered good style in your own language. But don't let breaking a taboo stop you from expressing yourself in the way that will best highlight your results and thus attract more readers.

Use 'generic + specific' constructions with caution

Generic statements are often redundant.

Do you notice anything missing in the following paragraph?

S1. Devices are becoming increasingly miniaturized, powerful, and cheap and have become part of our daily lives. Notable examples include smart phones and smart watches equipped with a plethora of sensors, home appliances and general purpose devices such as tablets and ultra-thin notebooks. We are surrounded by all these devices daily in a pervasive way, at home, work and also in public spaces – as anticipated in Mark Weiser's visionary observation: "The most profound technologies are those that disappear."

The original version of S1 contained the following introductory sentence:

S2. The last decade has been characterized by advances in device manufacturing.

S2 says nothing that the reader doesn't already know, and its main point is repeated in the next sentence. Moreover, its very generic nature does not invite the reader to continue reading. It can therefore be deleted.

Using an introductory sentence at the beginning of a new section or paragraph is clearly a good idea as it acts as a topic-sentence alerting the reader about what is coming next.

However, where possible the introductory sentence should also be eye-catching.

A sentence such as Devices are becoming increasingly miniaturized, powerful, cheap and have become part of our daily lives does not attract attention.

Remember that your readers will not be reading every word, sentence or paragraph of your paper. Their eyes will be skimming down the page (rather than slowly reading across the page horizontally). Their eyes are waiting to rest on something that attracts their attention.

So a better start to S1 would be:

S3. Way back in 1991 Mark Weiser observed that "The most profound technologies are those that disappear." In fact, increasingly miniaturized, powerful, and cheap devices have become part of our daily lives, for example smart phones and smart watches, home appliances, tablets and ultra-thin notebooks. We are surrounded by all these devices: at home, work and also in public spaces.

Note how S3 attracts much more attention by

- including a date and a name at the beginning of the sentence. Numbers and names (with their initial capital letters) stand out in a text

- removing all the generic phrases that add no real value: notable examples include … equipped with a plethora of sensors … general purpose devices such as … in a pervasive way

- concluding with a sentence that recalls the introductory sentence, thus giving the paragraph a sense of cohesiveness

Clearly, I have been quite extreme in the number of generic phrases I have removed, but this is to show you how often we tend to write too many phrases that give no new information and simply fill the text unnecessarily and thus make the reader waste time.

Try to be as concrete as possible as soon as possible

Compare these two texts:

S1. Smart devices may have to manage sensitive information that, often, must be protected against unauthorized diffusion or from malicious attacks. Some notable examples of sensitive information are data concerning the health conditions of a patient or data gathered from caregivers about the status of an elderly person.
S2. Smart devices may have to manage sensitive information, for example the health conditions of a patient or data gathered from caregivers on the status of an elderly person. Clearly, such data must be protected against unauthorized diffusion or from malicious attacks.

In S1, readers have to wait to understand exactly what sensitive information is and why it has

to be protected.

S2 tells readers immediately what sensitive information is, and therefore enables readers to understand why it should be protected. S2 also uses fewer words.

I am not suggesting that you should always use S2 rather than S1. Just be aware that the same information can be presented in a different order. Your aim is to choose the most effective order.

UNIT-II

ABSTRACT

Anticipate possible opposition by your referees and readers by not saying things too assertively or directly. In practical terms, it is not difficult to insert 'we believe' and 'might' when describing key findings that could be interpreted in different ways. And if by using these hedging devices you increase your chances of having your paper accepted in a journal located in the USA or UK, then you should use them!

- Tone down verbs, adjectives, adverbs and your general level of certainty.
- Be aware that the ways you express uncertainty may simply not translate into English.
- Provide alternative interpretations of your data.
- Tell the reader from which standpoint you want them to interpret or judge your data.
- Use impersonal forms to distance yourself when interpreting your findings.
- Save your face by writing in an impersonal fashion.
- Try to put the work of other authors in a positive light. If appropriate, say their work is open to another interpretation (i.e. yours).
- Don't over hedge.
- Consider getting help from a native speaker when hedging your claims.

Note: There may be occasions when you really want to convince the referee that your hypothesis is essentially the only interpretation, i.e. you don't want to give the idea that there is an element of doubt.

Plagiarism in its simplest terms means cutting and pasting from other studies and papers. It also means taking credit for work that others have done.

Plagiarism includes plagiarizing your own work. In fact, some journals stipulate that you cannot use more than five consecutive words from another paper that you have written.

If a referee thinks you may have plagiarized other people's work or your own, then there is a very high probability that he or she will recommend rejecting your paper. If you commit plagiarism within your university or institute, then you may risk expulsion.

This chapter is designed to help you understand what is and what not plagiarism is, and how to paraphrase other people's work (but always giving a reference). Paraphrasing is also useful for avoiding repetition within your manuscript, and as a means to avoid writing words or phrases

that you are not sure is correct.

Plagiarism is not difficult to spot

Plagiarism is very easy to identify, particularly in papers written by non-native speakers. Plagiarism is particularly evident if you copy phrases from the Internet that contain examples of non-scientific English (e.g. that come from advertisements describing the technical features of a product) or that contain the second person pronoun 'you'. There are many different forms / registers of English (e.g. scientific, commercial, colloquial), and you should not mix them. The problem is that you may not be able to recognize which register a text is in.

I revise a lot of research papers from my PhD students. Sometimes I read a paragraph that contains a considerable number of mistakes in the English (grammar, vocabulary, spelling etc.) and then suddenly there is a sentence written in perfect English! If I then Google the sentence, I very frequently discover it comes from a published paper.

What I do using Google, editors can do using specific software. One such software provider is authenticate, whose website (http://www.ithenticate.com/) contains much useful information about plagiarism, including a survey amongst academics on what constitutes plagiarism.

The iThenticate survey identified 10 types of plagiarism, including: resubmitting the same paper to many different journals so as to get it published more than once; self-plagiarism (i.e. if you re-use your own work without saying so); not referencing other works correctly; and taking someone else's words and making them seem like your own and without any attribution. The worst case is taking someone else's manuscript and submitting it under your own name.

Clearly, it is not just editors that can benefit from such software. If you are worried that you might have unintentionally plagiarized someone's work (particularly when you are using text that you may have written many months or years ago), then you can use software to check (other tools include CrossCheck, Turnitin, and eBlast).

How to quote directly from other papers

If you use any of the parts of Wood's text that are not in italics without any acknowledgement you are committing plagiarism.

Let's imagine you wanted to quote from the last line of Wood's paper, which concludes as follows:

> The owners of international scientific English should be international scientists not Englishmen or Americans.

You can cite the exact phrase or sentence used by putting it in quotations marks. Then reference the author.

> As noted by Wood [1997]: "The owners of international scientific English should be

inter- national scientists not Englishmen or Americans".

As an alternative to *As noted by Wood [1997]* you could say:

Wood [1997] concludes:

As Wood [1997] states:

As Wood states in his 1997 paper:

In his Conclusions, Wood [1997] writes:

How you make the reference to Wood's paper will obviously depend on your journal's style.

Putting quotation marks ("…") around an unaltered sentence and giving the proper citation for the origin of the work does not technically constitute plagiarism. But it may indicate to supervisors and referees that you have not actually understood what you have written – it is not your own work.

The following comment comes from Dr Ronald K. Gratz's very useful online article

Paraphrasing the work of a third author

Another case is where you want say the same thing as another author (Wood, in S1), regarding a finding that does not belong to Wood but to a third author's work (Hinds, in S1) which Wood refers to. In this case Wood is discussing the literature, rather than his own personal ideas.

S1. More generally Hinds has put forward a widely discussed position that Japanese has a different expectation as to the degree of involvement of the reader compared to English, with Japanese giving more responsibility to the reader, English to the writer.

You could paraphrase S1 as follows:

S2. Many authors, for example Hinds, have proposed that the level of expected reader involvement in Japanese writing is higher than in English.

S3. It is generally accepted that Japanese writers expect their readers to be more involved than do English writers.

S2 retains the name of the author mentioned by Wood. S3 is stronger and suggests that what Hinds originally proposed has now become generally accepted (an alternative expression is *it is well known that*). This is commonly the case. In fact, Wood's article was published in 1997, since then several other papers and books have been published on the topic, which have reinforced what Hinds proposed.

Plagiarism: A personal view

It is easy to become obsessed by plagiarism, particularly given that you can be 'discovered' by software.

But there is a danger that the anti-plagiarists become unnecessarily rigid. In my view, plagiarism is unacceptable under three main circumstances:

- plagiarism of others: when you try to deceive editors and readers that some findings are yours when in reality they are someone else's and you have made no attribution to the original author

- quoting directly from another author (and referencing the quotation), but regarding a context that the original author did not intend. This is known as 'quoting out of context', i.e. where someone doesn't report fully what the 'author' meant but just uses a particular part of what was said in order to make a completely different point.

- self-plagiarism: when you try to publish essentially the same paper in more than one journal

However, what I personally feel is acceptable self-plagiarism is in cases where you:

1. repeat the methods that you reported in a previous paper, if the method is exactly the same
2. use text from your own previous works but for a totally different audience

- Plagiarism is a serious issue in international science, even though it may not be considered so in your country of origin. It is easy for native speakers to spot it in the work of nonnative speakers. If you commit plagiarism your credibility and reputation will be seriously compromised. If you not sure whether you have plagiarized your own or someone else's work, use plagiarism software

- Copying phrases from other people's work is perfectly acceptable and is a good way to learn useful phrases in English that you can then use in your own work. However, such phrases must be 100% generic in the sense that they hold absolutely no hard information

- Use direct quotations sparingly. The problem is that the referee (or your professor) cannot be sure that you have fully understood the quotation

- Typical ways to paraphrase:

  - use of synonyms for non-key words (especially verbs, adverbs and adjectives)

  - change of part of speech, for example: from noun to verb, from noun to adjective, from one category of noun to another category of noun (e.g. *science* to *scientist*)

  - change of nouns and pronouns from singular to plural and vice versa

  - change of verb form, for example: from *–ing* form to infinitive, from simple to continuous, from active to passive

- change of style from personal to impersonal
- reversal of the order in which information is presented

An Introduction generally answers the following questions. You can use the answers to these questions to structure your Introduction.

- What is the problem?
- Are there any existing solutions (i.e. in the literature)?
- Which solution is the best?
- What is its main limitation? (i.e. What gap am I hoping to fill?)
- What do I hope to achieve?
- Have I achieved what I set out to do?

If your Introduction is more than a couple of pages, subheadings will make it much more 'digestible' for the reader.

How does an Introduction differ from an Abstract?

There is some overlap between an Abstract and the Introduction. However, a frequent problem is that authors may cut and paste from their Abstract into their Introduction, which can be very repetitive for readers.

Below are the first two sentences from the Abstract and Introduction from a paper (or 'Letter' as it is called in the journal where this study appeared) entitled *Fragmentation of Rods by Cascading Cracks: Why Spaghetti Does Not Break in Half* by Basile Audoly and Sébastien Neukirch. These sentences highlight the distinct ways that an Abstract and Introduction should be written.

> Abstract When thin brittle rods such as dry spaghetti pasta are bent beyond their limit curvature, they often break into more than two pieces, typically three or four. With the aim of understanding these multiple breakings, we study the dynamics of a bent rod that is suddenly released at one end.

The Abstract immediately tells the readers the specific topic of the paper and then what the author's goal is. Instead, the Introduction sets the context in very general terms.

The abstract then continues as follows.

> Abstract We find that the sudden relaxation of the curvature at this end leads to a burst of flexural waves, whose dynamics are described by a self-similar solution with no

adjustable parameters. These flexural waves locally increase the curvature in the rod, and we argue that this counterintuitive mechanism is responsible for the fragmentation of brittle rods under bending.

As you can see, the Abstract gives no further background information, but high- lights what the authors found in their research. An absolute minimum number of words have been used. This gives the Abstract substantial impact by telling readers only what they need to know to enable them to decide whether to read the whole paper. As is standard for Abstracts, no references to the literature are made.

On the other hand about 50% of the rest of the Introduction is dedicated to helping the readers see that the general trend given in the first two sentences is being countered by another line of research. In this case, references to the literature are made. Readers are alerted to the alternative trend by the link word *nevertheless*.

INTRODUCTION Nevertheless a growing number of works have included physical considerations: surface energy contributions [6], nucleation and growth properties of the fracture process [7], elastic buckling [8, 9], and stress wave propagation [10]. Usually, in dynamic fragmentation, the abrupt application of fracturing forces (e.g. by an impact) triggers numerous elementary breaking processes, making a statistical study of the fragments sizes possible. This is opposed to quasi-static fragmentation where a solid is crushed or broken at small applied velocities [11].

The concluding sentence of the Abstract is:

ABSTRACT A simple experiment supporting the claim is presented.
This eight-word sentence is expanded considerably in the Introduction, by describing more about what the experiment consisted in, and the result it gave. Note: the text reported below is the rest of the Introduction in its entirety.

INTRODUCTION Here we consider such a quasi-static experiment whereby dry spaghetti is bent beyond its limit curvature. This experiment is famous as, most of the time, the pasta does not break in half but typically in three to ten pieces. In this Letter, we explain this multiple failure process and point out a general mechanism of cascading failure in rods: a breaking event induces strong flexural waves which trigger other breakings, leading to an avalanche-like process.

How long should the Introduction be?

There is no definitive answer to this question.

Find the most cited papers in your field, and note the proportion of space given to the Introduction relative to the other sections. Adopt the same proportion.

I have noticed that the longer the Introduction in relation to the rest of the paper, the lower the level of innovation. Often authors write a huge introduction to hide the fact that they have very

little to say about their actual research. Reviewers are aware of this trick!

Think about introductions in other areas of life - in a 10 minute oral presentation at a conference would you want eight minutes of introduction? In a 20 minute TV interview with a famous personality, would you want 10 minutes of introduction before the personality even utters a word? I know that presentations and interviews cannot be directly compared to research papers, but the basic idea is that both viewers and readers want the same thing: the meat.

How should I begin my Introduction?

Below is an example of the structure of a typical Introduction. It consists of a sequence of ten parts, each with a specific role. Your Introduction will not necessarily include all ten parts nor sequence them in the same order.

Your aim is to include only enough background information to allow your reader to understand why you are asking the questions you are, in what context they appear, and why your hypotheses, predictions or expected results are reasonable. It is like a preview to the rest of the paper. Thus, nearly every Introduction, irrespective of the discipline, would incorporate those parts marked with an asterisk (*).

The proportion of space given to each part (particularly with regard to the review of the literature) will obviously vary from discipline to discipline, and from paper to paper.

You could begin with one or more of the first four parts listed below.

Below is an analysis of Parts 1–4 of the Introduction. In brackets is a very approximate indication of how many sentences you will probably need for each part.

PART 1 DEFINITION of THE TOPIC PLUS BACKGROUND (1–3)

This introductory phrase may not be necessary in your paper. Here the definition of the XYZ battery indicates to the reader that this is the background topic (i.e. the general context) of the paper. This is the place to include notations, technical definitions, and explanations of key words.

The second sentence gives information that readers should already be familiar with and suggests why the topic is important and of interest. It will help readers to under- stand why you are investigating this area and how you hope to extend the knowledge. It sets the context for the information, which may be less familiar for your readers. Readers want to quickly learn what the specific topic of your research is, they are much less interested in being reminded how important the general area of research is.

PART 2 ACCEPTED STATE of THE ART PLUS PROBLEM TO BE RESOLVED

In the example text, XYZ batteries are the general context. The authors now move from this

general context to the specific area of their research: XYZ batteries in telephones, and more specifically, the problems inherent in such batteries. This is the gap that the authors want to fill and that the readers should be most interested in. This part should state in simple and clear language exactly what the problem is, why you chose it and why you claim it is important.

PART 3 AUTHORS' OBJECTIVES

Here the authors outline their major objectives, i.e. how they intend to fill the gap. This part also serves as a transition into the review of the literature.

PART 4 INTRODUCTION TO THE LITERATURE

This introduces the background literature that the authors intend to refer to in order to motivate their particular research. It makes a reference to current insufficient knowledge of the topic.

This may be in a separate section with its own heading or after the Results in a clinical paper, or incorporated into the Discussion.

My research area is not a 'hard' science. Are there any other ways of beginning an Introduction?

Clearly, not all disciplines would use the structure outlined in the previous subsection, though they would still cover some of the same main points. An alternative, and quite common approach, is to set the context and research goal in a series of questions.

Here is an example from a dissertation entitled The Effects of Feedback and Attribution Style on Task Persistence by psychology student Chris Rozek. Persistence means the ability to adhere to a task, to persevere with something rather than giving up.

Persistence is an attribute valued by many. What makes some people persist longer than others? Are internal factors, such as personality traits, or external situational factors, such as feedback, responsible for persistence? Could the answer include a combination of both? These are the questions this experiment attempted to answer.

The general topic is mentioned in the very first word (persistence) of a very short sentence (seven words). This enables the reader to immediately focus on and understand the context. Within this context, the second sentence, in the form of a question, outlines the issue that Chris plans to address in his paper (Point 3). His next sentence poses the typical attributes associated with persistence (similarly to Point 5). The question Could the answer include a combination of both? hints at what the likely findings of his paper are (Point 7). The final sentence highlights that Chris will cover all the aspects he has mentioned so far. His Introduction then continues with a literature review (Point 6) and concludes with his final hypothesis (similarly to Point 9).

Chris has neatly covered a lot of points typically mentioned in an Introduction. He has achieved this in very few sentences and with a format (questions) that immediately involves

the reader by encouraging them to formulate their own answers and thus to continue reading. To make a self-assessment of your Introduction, you can ask yourself the following questions.

What are typical pitfalls of an Introduction?

The Introduction is often the least interesting for you to write, as you may feel it is only incidental to your research.

In an attempt to save time, researchers often skip over whole periods and papers that led to their research and may simply cite a series of references with a throwaway comment such as: *these were great efforts preceding our work.*

However, it is at some point necessary to present the novelty of your approach and results in the context of what has already been done. Citing key papers, but without stating how specifically you build on them, is insufficient.

It is not necessary to "do better" or "more" than them, but (i) describe, with at least one sentence, what others have done, as far as relevant for the direction of your paper, and (ii) describe how your contribution is original and distinguishes itself from previous work. You can do this by:

- listing the shortcomings of previous approaches with a clear analysis of how your proposed approach is an improvement. Match each shortcoming with the advantage that your approach offers

- introduce a new approach, algorithm, procedure, set-up, experiment etc and validate it

If a reviewer calls for you to add more details to your Introduction, by writing a sentence such as "The authors ignore over 30 years of xxx community efforts in relation to yyy", then you cannot simply put additional references.

By covering previous work, you will be able to highlight what the great potential improvements are that your approach could bring. If you do that, your own approach will then be sufficiently introduced and justified. Some of the manuscripts you review will help yours because they raise questions that you can address. Of course, other researchers have probably pursued similar avenues, and those papers also need to be cited in this regard.

What typical phrases should I avoid in my Introduction?

Referees have to read a lot of papers. While this can be a very rewarding task, it can also be quite tedious when many Abstracts and Introductions seem to begin in the same way. Thus, some writing experts advise avoiding stock phrases (i.e. typical phrases that everyone uses) at the beginning of the introduction. For example: *Recent advances in … The last few years have seen …* Instead they recommended beginning in a more direct way.

How should I outline the structure of the rest of my paper?

Check with your journal's instructions to authors with regard to whether an outline of the structure is required. If it is, or if you notice that all the papers in the journal have one, then your aim should be to describe this structure as concisely as possible (as in the RV).

Summary

- Does my Introduction occupy too high a proportion of the entire paper and does it contain too many general statements that are already widely known?
- Are the rationale and objectives defined? Is it clear what problem I am addressing or trying to solve and why I chose my particular methodology?
- Is the background information all related to the objective of the paper?
- Is it clear what the reader can expect in the rest of the paper (i.e. main results and conclusions)?
- Does my Introduction act as a clear road map for understanding my paper?
- Is it sufficiently different from the Abstract, without any cut and pastes? (some overlap is fine)
- Have I mentioned only what my readers specifically need to know and what I will subsequently refer to in the Discussion?
- Have I been as concise as possible?
- Have I used tenses correctly? PRESENT SIMPLE (general background context, description of what will be done in the paper), PRESENT PERFECT (past to present solutions), PAST SIMPLE (my contribution, though this may also be expressed using the PRESENT SIMPLE or FUTURE SIMPLE)

UNIT-III

DISCUSSION AND CONCLUSIONS

How should I structure my Review of the Literature?

A Literature Review generally answers the following questions, and generally in the following order. You can use the answers to these questions to structure your Literature Review.

1. What are the seminal works on my topic? Do I need to mention these?
2. What progress has been made since these seminal works?
3. What are the most relevant recent works? What is the best order to mention these works?
4. What are the achievements and limitations of these recent works?
5. What gap do these limitations reveal?
6. How does my work intend to fill this gap?

Do I need to cover all the literature? And what about the literature that goes against my hypotheses?

Unless you are writing a review paper, then you do not need to cover absolutely all the literature. You need to cover the literature that justifies your research and relates to it – both positively and negatively.

By 'negatively' I mean any literature in your specific field that is not in agreement with your hypotheses, approach, and findings. Your aim is not to have a reviewer make a comment such as:

The authors' literature review was limited to those papers that supported their hypotheses rather than covering all the literature related to the study.

Remember that your mission as a researcher is not to blindly follow just one path in order to reach your specific objective and prove your point. You have to be open to other possibilities and show your readers that there are other possible approaches and other possible conclusions.

How should I begin my literature review? How can I structure it to show the progress through the years?

Below is an extract from the Introduction to a paper entitled The Effects of Feedback and Attribution Style on Task Persistence where psychology student Chris Rozek begins his review of the literature (see 14.6 for how he begins the Introduction).

Persistence has most often been studied in terms of cultural differences. Blinco (1992) found that Japanese elementary school children showed greater task persistence than their American counterparts. School type and gender were not factors in moderating task persistence. This left culture as the remaining variable.

Heine et al. (2001) furthered this idea by testing older American and Japanese subjects on responses after success or failure on task persistence. Japanese subjects were once again found to persist longer (in post-failure conditions), and this was speculated to be because they were more likely to view themselves as the cause of the problem. If they were the cause of the problem, they could also solve the problem themselves; although this could only be accomplished through work and persistence. Americans were more likely to believe that outside factors were the cause of failure.

These cultural studies hinted that task persistence may be predictable based on attribution style. A later experiment showed that attribution style and perfectionism level can be correlated with final grades in college-level classes (Blankstein & Winkworth, 2004).

The first sentence of the first paragraph introduces the main topic (cultural differences), and the rest of the paragraph briefly reviews a major study on this topic. The implications of this study (culture as the remaining variable) are summarized at the end of the paragraph.

The first sentence of the second paragraph then moves on to the next (in chronological terms) major study. Chris summarizes Heine's work in a way that involves the reader: he uses the verb speculated and then continues the next sentence using if which gives an example of this speculation.

The first sentence of the third paragraph summarizes the findings of the first two paragraphs in order to introduce some more recent findings.

Note also his use of tenses. In his first sentence, which is a very general overview, he uses the PRESENT PERFECT. Then when he talks about the work of specific authors and makes a summary of each step in the chronology of the literature he uses the PAST SIMPLE.

Chris's structure is thus:

1. Introduction to topic
2. Support from the literature
3. Mini summary
4. Introduction to next topic. And so on.

This technique works very well because it tells a story – it is a logical build up to the reason behind Chris's investigation that readers can easily follow. In fact, the final sentence to his Introduction begins: Because of these findings, I hypothesize that … Chris has gradually prepared his readers for the focus of his work: his own personal hypothesis regarding persistence.

What is the clearest way to refer to other authors? Should I focus on the authors or their ideas?

There are various styles for making reference to other authors. The four styles below contain the same information, but the focus is different.

STYLE 1 Blanco [1992] found that Japanese elementary school children showed …
STYLE 2 In [5] Blanco found that Japanese elementary school children showed …
STYLE 3 A study of the level of persistence in school children is presented by Blanco [1992].
STYLE 4 A greater level of persistence has been noticed in Japan [5].

In Style 1, the author, Blanco, is given as much importance as what he (i.e. Blanco) found. You might choose this style for one of three reasons: (i) it is simply the easiest style to use and the most readable for readers, (ii) you may want to focus on the author more than what he/she found, (iii) you may want to compare two authors (e.g. While Blinco says X, Heine says Y).

Style 2 is similar to Style 1, but in this case perhaps you are talking about more than one paper by Blinco, so the paper is the most logical first element in the sentence.

In Style 3, what Blinco found is more important than the fact that Blinco found it. This is a very typical style, but inevitably involves using the passive, which then leads to longer and heavier sentences.

In Style 4 Blinco is not mentioned at all, but only a reference to his paper in parentheses.

The style you use will depend on your journal's "Style Rules", but is likely to contain an element of flexibility. In fact, Chris Rozek's Introduction in Sect. 15.4 uses two styles:

Heine et al. (2001) furthered this idea by testing …

… can be correlated with final grades in college-level classes (Blankstein & Winkworth, 2004)

He does this to:

- Change the focus from author to findings
- Create variety for the reader

How can I talk about the limitations of previous work and the novelty of my work in a constructive and diplomatic way?

Sometimes in the Literature Review you want your readers to note the strong features of your work and the limitations of previous works by other authors. If what you propose has never been done before, you can begin your sentence as indicated by the words in italics below.

As far as we know, there are no studies on …

To [the best of] our knowledge, the literature has not discussed …

We believe that this is the first time that principal agent theory has been applied to …

If you want to mention the limitations of previous works you could adapt one or more of the following sentences:

Generally speaking patients' perceptions are seldom considered. Results often appear to conflict with each other …
So far X has never been applied to Y.

Moreover, no attention has been paid to …

These studies have only dealt with the situation in X, whereas our study focuses on the situation in Y.

What tenses should I use?

The PRESENT SIMPLE (S1) or PRESENT PERFECT (S2) are generally used to introduce the literature review.

S1. In the literature there are several examples of new strategies to perform these tests, which all entail setting new parameters.
S2. Many different approaches have been proposed to solve this issue.

Use the PRESENT PERFECT again to refer to ongoing situations, i.e. when authors are still investigating a particular field. Even though specific past dates are mentioned in S3 and S4 below, these dates are part of a series of dates that describe situations that researchers are still working on today and will continue in the future.

This means that PAST SIMPLE cannot be used in any of these three cases.

S3. Since 2016 there have been many attempts to establish an index, but until now no one has managed to solve the issue of ….
S4. As yet, a solution to Y has not been found, although three attempts have been made.
S5. So far researchers have only found innovative ways to solve X, but not Y.

In S3–S5 note the underlined words. These are adverbials of time that are typically used with the PRESENT PERFECT because they indicate something that began in the past (i.e. when research first began in this area) and continues into the present.

The PRESENT PERFECT is also used when talking about research that was carried out at some indefinite time in the past, or when the moment it was carried out is of no relevance for the purposes of the present paper.

S6. It has been shown that there is an inverse relation between the level of bureaucracy in a country and its GDP.
S7. Other research has proved that bureaucracy can have a negative impact on incentivizing companies to adopt environmental measures.

Although in S6 there is no reference, the author is implying that the 'inverse relation' was not found by him/her, but by another author. In any case, it is always advisable to put a reference. If the present tense had been used ('it is shown') then the reader would think that the author is talking about the present paper.

S7 indicates a case where an explicit date is given in the reference (i.e. 2018), but for the author of the present paper it is the finding (i.e. bureaucracy's negative impact) that is the key point rather than the date this finding was reported in the literature.

You must use the PAST SIMPLE when:

- The year of publication is stated within the main sentence (i.e. not just in brackets)
- You mention specific pieces of research (e.g. you talk about initial approaches and methods that have subsequently probably been abandoned)
- You state the exact date when something was written, proved etc.

In S8–S10 below we are talking about completely finished actions, so the PRESENT PERFECT cannot be used.

S8. The first approaches used a manual registration of cardiac images, using anatomical markers defined by an expert operator along all images in the temporal sequence. Then in 1987, a new method was introduced which …
S9. This problem was first analyzed in 2014.
S10. Various solutions were found in the late 1990s.

In all other cases, the simplest solution is to follow the style of the examples below.

S11. Lindley investigated the use of the genitive in French and English and his results agree with other authors' findings in this area. He proved that …
S12. Smith and Jones developed a new system of comparison. In their system two languages are / were compared from the point of view of … They found that ….
S13. Evans studied the differences between Italian and English. He provides / provided an index of.

In S11–S13 the first verb introduces the author and is typically used in the PAST SIMPLE. Other similar verbs are, for example: examine, analyze, verify, propose, design, suggest, outline.

Note that the first verb in S11–S13 could also be in the PRESENT SIMPLE. However, generally when the PRESENT SIMPLE is used the construction is slightly different (S14): first the reference and then the author.

S14. In [5] Evans studies the differences ….

In any case, even in S14 the SIMPLE PAST (studied) would be fine.

The second verb in S11–S13 describes what the authors found. In S9 agree is logical because Lindley's findings still agree today with the findings in the papers referenced at the end of the sentence. In S12 and S13, both PAST SIMPLE and PRESENT SIMPLE are possible. However, it is common to use the PRESENT SIMPLE when describing how a system, method, procedure etc. functions. In S12 the PRESENT SIMPLE underlines that Smith and Jones are still using their system and that it is still valid. The use of the PAST SIMPLE (were compared) in S12 would probably imply that Smith and Jones' system is not in use anymore and it was just a step in this road of research that has subsequently been superseded.

The third verb in S11–S13 indicates what the author managed to do (find, obtain, prove, demonstrate, highlight), and typically such verbs are used in the PAST SIMPLE (found, obtained etc.). Again, however, some authors use the PRESENT SIMPLE in such cases.

Use the PRESENT SIMPLE to discuss previously published laws, theorems, definitions, proofs, lemmas etc. Such published work is generally considered to be established knowledge and the use of the PRESENT SIMPLE reflects this.

S15. The theorem states that the highest degree of separation is achieved when …
S16. The lemma asserts that, for any given strategy of Player 1, there is a corresponding …

Summary: How can I assess the quality of my Literature Review?

To make a self-assessment of your Literature Review, you can ask yourself the following questions.

- Have I shown that I am familiar with the state of the art.
- Have I mentioned only what my readers specifically need to know and what I will subsequently refer to in the Discussion?
- Have I avoided only mentioning the literature that supports my hypotheses?
- Are the papers I have mentioned in a logical order? Is it clear why I have chosen these papers and not others?
- Have I selected a disproportionate number of papers from my own country?
- Have I ensured that there are no papers cited in the bibliography that are not cited in the paper, and vice versa?
- Have I followed my journal's instructions regarding how I make references to the literature? Where possible have I done this in a variety of ways?

- ➢ Have I removed any redundancy when reporting the literature?

- ➢ Have I used tenses correctly? PRESENT SIMPLE (descriptions of established scientific fact), PRESENT PERFECT (at the beginning of review to give general over- view; for past-to-present evolutions), PAST SIMPLE (when specific dates are mentioned within a sentence; for the verbs that introduce an author's findings)

The Methods section should answer most of the following questions, obviously depending on your discipline:

- What / Who did I study? What hypotheses was I testing?
- Where did I carry out this study and what characteristics did this location have?
- How did I design my experiment / sampling and what assumptions did I make?
- What variable was I measuring and why?
- How did I handle / house / treat my materials / subjects? What kind of care / precautions was taken?
- What equipment did I use (plus modifications) and where did this equipment come from (vendor source)?
- What protocol did I use for collecting my data?
- How did I analyze the data? Statistical procedures? Mathematical equations? Software?
- What probability did I use to decide significance?

You should provide enough quantitative information (concentration, temperature, weight, size, length, time, duration etc.) so that other researchers can replicate what you did.

Describe everything in a logical order to enable readers to easily follow what you did. This will usually be chronological, i.e. the order in which you conducted the phases of your tests. It may also help the reader if you use sub- headings to explain the various stages of the procedure, which you can then use again (perhaps with modifications) in the Results.

Your experiments, sampling procedures, selection criteria etc. may have more than one step. It helps your readers if your description of each step follows the same logical order.

Ensure that you cover every step required. Because you are very familiar with your method, you may leave out key information either thinking that it is implicit (and thus not worth mentioning) or simply because you forget.

What style: should I use the active or passive? What tenses should I use?

The passive is good style in this part of a research paper because the focus is on what was done rather than who did it. Thus you can ignore any expert advice that tells you that the passive should always be avoided. It should be avoided, but only where it is not necessary. In the Methods the passive is both necessary and appropriate.

Most Methods sections are written in the PAST SIMPLE and/or PRESENT SIMPLE. The choice will depend on your discipline (and whether it is applied or theoretical), your chosen journal, and what actions you are describing.

The PAST SIMPLE is required when you describe actions that you did, both before and during your experiments (in the lab, in the field, while conducting surveys etc). Thus the PAST SIMPLE is likely to be used in most of this section.

Below is an example of the PAST SIMPLE used to describe some preliminary work.

An explorative research approach was adopted using a seven-page survey on opinions and religious background. The findings were collected using an internet questionnaire survey. Six hundred religious institutions were selected from AMADEUS database, which were then classified into three groups based on …

Here are the methods used by an agronomist, again using the PAST SIMPLE:

A test bench was used in order to evaluate the effectiveness of the flame burner. Steel plates were treated with an open-flame burner.

The PRESENT SIMPLE is required when you describe a standard method, i.e. not one you invented yourself for the specific purpose of the research that you are reporting in your paper.

For example, if your paper is on ways to recycle paper, when describing methods that have been reported in the literature, you will use the PRESENT. But then, when you describe the various phases of your own system for recycling, then you would probably use the PAST.

The PRESENT SIMPLE is also often used when you are presenting your procedure, model, software, device etc. In this case the active form is often used.

Firstly, we define x as an exogenous measure of the natural rate of longevity of people.

As in Chakraborty (2017), we assume that … The rule is thus given by the following formula:

Our machine uses diesel … It has a 1000 hp engine … The application requires 10 TB of space …
If you are in doubt, then look at your chosen journal and check what tense other authors use in the Methods section.

How should I begin the Methods?

How you begin will very much depend on your discipline. To help you decide, take a look at the Methods section in papers from your chosen journal, and see how authors start this section.

Typical ways include:

(a) Making a general statement about your method.
The method described here is simple, rapid, sensitive and …

(b) Referring to another paper.
The materials used for isolation and culture are described elsewhere. Materials were obtained in accordance with Burgess et al.'s method.

(c) Stating where you obtained your materials from.
Bacterial strains …were isolated and kindly supplied by …
Agorose for gel electrophoresis was purchased from Brogdon plc (Altrincham, UK).

(d) Explaining how you found your subjects, i.e. begin with the setting.
Subjects were chosen from a randomly selected sample of …
Participants were selected from patients at the Gynecology Faculty of the University.

(e) Indicating where (i.e. a geographical region) your investigation was focused.
Our empirical investigation focused on Tuscany, a central region of Italy, The study was carried out in four boulevards in Athens (Greece) and …

(f) Referring the reader to a figure which shows the experimental set-up.
To highlight the advantages of the system, Fig. 1 shows the …

(g) Starting directly with the first step in your procedure.
Frontal cerebral cortices were dissected from …
Core-cell composite materials were prepared by colloidal assembly of …

My methods use a standard procedure. Do I need to describe the methods in detail?

No. You can alert the reader that the method is 'standard' and is described in another paper or in some manufacturer's instructions to their product (make sure you give a clear reference to the related paper or the instructions).

If you use a phrase such as based on methods previously described, then you need to make it clear whose these methods are: yours or someone else's. If they are yours, then it would be less ambiguous to write:

S1. based on methods described in our previous paper [56].

Even though you might use a standard procedure, you will probably have adjusted it in some

way and you should mention these modifications:

S2. Our methods followed the procedures outlined in [Wallwork, 2017] with the two minor modifications:
S3. Our procedure is as according to [Wallwork, 2017] with the following exceptions:

Finally, if your entire methodology is novel and this novelty is the basis of the whole paper, then you might consider writing a separate paper dedicated exclusively to this new methodology.

My methods in the paper I am writing now are (almost) identical to the methods I published in a previous paper. Can I repeat them word for word?

If you simply duplicate what you wrote in a previous paper, the editor may consider this to be plagiarism.

Simply putting a reference to the original paper where your methods are described is probably not enough as (i) it will make your Methods section look very short, (ii) it is not very helpful for readers. A better solution is to write:

S1. Full details of the methods used can be found in our previous paper [45]. In brief,

S1 highlights that you should:

- put a reference to where the reader can find the full version of your methods
- clearly state that the reference is to a paper written by your research group (our previous paper)
- begin a summarized version with the phrase In brief. This phrase alerts the reader that what he/she is going to read now is not the full version of your methods

Also, this gives you the opportunity to talk about any modifications you may have made to your original methods.

Clearly, your current paper should be about a different topic from the paper where the original methods were published.

Should I describe everything in chronological order?

The basic idea is to present everything in your experiments, trials, procedures etc. in a way that will make best sense to your reader. The fact that you did something before or after something else, may not be relevant for your reader, so in such cases chronology is not important.

However within a sentence or paragraph, readers should feel they are moving forward chronologically.

S1. * The sample, which was filtered and acidified at pH 2, was mixed with X.
S2. * The sample was filtered and acidified at pH 2 and then mixed with X.
S3. The sample was filtered and acidified at pH 2, and then mixed with X.
S4. The sample was filtered and acidified at pH 2. It was then mixed with X, which enabled the resulting solution to stabilize at …

In S1 the main idea is that the sample was mixed with X, but we seem to be going backwards (to the filtering and acidification) before we go forwards again to the mix- ing. S2 resolves this problem by removing the which-clause and presenting the steps in sequence. However, S2 uses and twice, which means the reader may be initially confused with regard to which two items are connected with each other (filtered + aciDified, or acidified + mixed). This is resolved in S3 by the addition of a comma after pH 2. However the clearest version is S4, which simply begins a new sentence.

S1 is an example of a very short sentence that could be rewritten more clearly. Often such sentences are much longer, so the technique given in S4 (rather than S3) may be the best solution.

How many actions / steps can I refer to in a single sentence?

A frequent problem in the Methods is that the description reads like a manual, where each individual detail or action is described in a single sentence. Given that you are describing a procedure rather than making a complex analysis, it is perfectly accept- able to have two actions in one sentence.

Below is the first paragraph from a medical paper in which the author describes how she selected the participants for her survey on depression. The word ‘practice’ means an association of medical doctors who offer a service to the public. The ‘list size’ is the number of patients the practice has.

Can I use bullets?

The second RV in 16.8 uses bullets to list the three types of practices. This makes it easier to read and also provides variety in the layout. However, refer to your journal’s style guide to check whether bullets are permissible.

You only need to number your bullets if each bullet describes a step that is part of a chronological sequence.

How can I reduce the word count?

The style of the first RV in 16.8 is to present more than one action per sentence. This reduces the number of words that are required – the RV is more than 20% shorter than the OV.

Other ways to reduce the word count are:

- assume your readers have basic knowledge of the techniques used in your field, you can thus delete any superfluous information

- cite a reference rather than detailing the procedure again if any of your methods are fully described elsewhere (in one of your papers or someone else's)

- use tables and figures to summarize information

How can I avoid my Methods appearing like a series of lists?

It is important to be concise in the Methods. But conciseness does not mean writing a series of lists (as in S1). This style may be appropriate on a presentation slide, but should be avoided in a paper. What you write should always sound natural if read aloud. S1 does not sound natural.

S1. Processes which often occur in lipids include: oxidation, hydration, dehydration, decarboxylation, esterification, aromatization, hydrolysis, hydrogenation and polymerization. Factors that affect the chemistry of these materials include: heat (anthropogenic transformations), humidity, pH, and microbial attacks.

S2 still contains the same processes and factors as S1, but the way these are introduced sounds more natural – even though it requires more words.

S2. Several processes often occur in lipids, including oxidation, hydration, dehydration, decarboxylation, esterification, aromatisation, hydrolysis, hydrogenation, and polymerization. In addition, the chemistry of these materials can be affected, for example, by heat (anthropogenic transformations), humidity, pH, and microbial attacks.

How can I avoid ambiguity?

In Robert Day's informative and amusing book How to Write and Publish a Scientific Paper, several real examples of ambiguous sentences from Methods sections are given. Here are two of them:

S1. *Employing a straight platinum wire rabbit, sheep and human blood agar plates were inoculated …
S2. *Having completed the study, the bacteria were of no further interest.

In S1 it seems that the rabbits were made of platinum wire, and in S2 it seems that the bacteria were responsible for completing the study. You may think that the real interpretations are very obvious, but the fact that Robert Day mentions them means that some referees and readers will also find them amusing and/or aggravating. One solution is to improve the punctuation as in S3, although a comma has been added after wire, S3 is still not.

S3. Employing a straight platinum wire, rabbit, sheep and human blood agar plates were inoculated with …

In S3 a comma has been added after wire. But the sentence is still not immediately clear because the use of a series of commas initially makes it seem like a list of things that were employed. S4–S6 are much clearer.

S4. Rabbit, sheep and human blood agar plates were inoculated with …by employing a straight platinum wire.
S5. Employing a straight platinum wire, we inoculated rabbit, sheep and human blood agar plates with …
S6. Rabbit, sheep and human blood agar plates were inoculated with …This was carried out using a straight platinum wire.

S2 could be rewritten as:

S7. Once the study had been completed, the bacteria were of no further interest.

For more on such problems of ambiguity

How should I designate my study parameters in a way that my readers do not have to constantly refer backwards?

In the second OV in 16.8 the author has designated the three types of medical practices as Type 1, Type 2 and Type 3. This enables her to save time whenever she has to refer to one of the practices. It saves her time, but not the reader. Later in the Methods (or even in the Results or Discussion), whenever readers see, for example, Type 1 they will have to refer backwards to remember which practice Type 1 refers to.

Although I generally recommend being concise, in this case conciseness is annoy- ing for readers. It is much easier for readers to read inner city practice than Type 1.

Another timesaver for the author is to use an invented acronym. So in this case, the author could have written ICP for inner city practice. But the same problem arises: the reader is forced to remember what ICP refers to.

So the solution is to use the abbreviated forms (i.e. Type 1 and ICP) immediately after you have defined them, i.e. within the same paragraph or at most in the next paragraph. Then, if for a few paragraphs they are not mentioned again, when you do mention them again give the full form in brackets. For example you can write:

… used with Type 1 (i.e. inner city practice).

and proceed as before (i.e. it is OK to use abbreviated form within the same and next paragraph).

What grammatical constructions can I use to justify my aims and choices?

You often need to be able to explain why you made certain choices in the light of what they subsequently enabled you to do.

To introduce your choices, you can use the following constructions:

In order to validate the results, we first had to …

In an attempt to identify the components, it was decided to …

To provide a way of characterizing the samples, an adaptation of Smith's method [2011] was used.

For the purpose of investigating the patients' previous medical history, we …

Our aim was to get a general picture of …

This choice was aimed at getting a general picture of …

The examples highlight that there are many ways (not all mentioned here) to express your aims and intentions. The important thing is to choose the right verb form (see the underlined verbs in the examples): the infinitive (to test) or the -ing form (of testing, at testing).

However, all the examples could be expressed much more simply using the infinitive form alone (e.g. To validate the results. To identify the components. To characterize the samples).

Another way to talk about your choices is to use the verb to choose. But note the construction:

This equipment was chosen for its low cost.

This equipment was chosen (in order) to save money.

What grammatical construction is used with allow, enable and permit?

There are several verbs in English that mean 'give the capability of' and highlight for your readers what your initial choices subsequently helped you to achieve.

Allow and enable are the most commonly used in research papers and are particularly common in the Methods section. Outside computer science, allow and enable can generally be used interchangeably. Another verb is to permit, which is used less frequently as it often has the meaning of an authority giving someone the permission to do something. All three verbs require the same specific construction. In the examples below I have just used allow, but in all these examples from a grammatical point of view *allow* could be replaced with *enable* and *permit*.

How can I indicate the consequences of my choices and actions?

Here are two examples that give two alternative endings (thus / thereby and consequently / next):

S1. An evaluation of this initial data demonstrated that X =Y,
thus giving an insight into the function of Z.
thereby providing a basis for investigating the function of Z.
S2. An evaluation of this initial data demonstrated that X =Y. Consequently the next step was to investigate the function of Z. The next step was thus / therefore / consequently to investigate …

In S1 the sentence is in two parts divided by a comma after Y. Note how thus and thereby require the -ing form after them. The -ing form alone, without thus and thereby could be ambiguous (Sect. 6.5).

In S2 the first sentence ends with Y. The first word in the next sentence is consequently. It would be possible to put thus and therefore (but not thereby) at the beginning of the sentence too but their most natural position is after the verb to be (Sect. 2.12). Other alternative words are hence, which is most generally used in mathematics, and so, which is generally considered too informal for research papers.

What other points should I include in the Methods? How should I end the Methods?

The Methods section is often the shortest section in a paper. However, in some studies the methods are the main contribution of the paper. In such cases, subsections with subheadings (e.g. sampling procedure, experimental set up, testing the model) may help readers to understand the various stages or various components.

Your first subsection may be a general overview of the methods chosen, how they relate to the literature and why you chose them.

Then in each subsequent subsection you:

1. Preview the part of the procedure / method you are talking about
2. Detail what was done and justify your choices
3. Point out any precautions taken (this also helps you gain credibility as a researcher who carries out his / her work accurately and thoroughly)
4. Discuss any limitations in your method or problems you encountered
5. Highlight the benefits of your methods (perhaps in comparison to other authors' approaches)

If your Methods section is short and does not require any subsections, then you could end it with one or more of Points 3–5 above. If it is long, then you could end with some conclusions regarding the limitations and benefits (Points 4 and 5) of your overall methodology.

How can I assess the quality of my Methods section?

To make a self-assessment of your Methods section, you can ask yourself the following questions.

- ➢ Are enough details given? Have I really described my Methods in a way that is easy for readers to follow and which would enable them to retrace or replicate my work? Have I ensured that I have covered every step? Is my structure clear and complete?

- ➢ Have I justified the choices I made (particularly when the choices might not be obvious)?

- ➢ Have I written everything clearly in reasonably short sentences, with no unnecessary semicolons? Have I been as concise as possible?

- ➢ Have I used references to previous works rather than repeating descriptions that readers could easily find elsewhere?

- ➢ Do the individual sentences in each paragraph contain too many, too few, or just the right manageable number of steps? Have I ensured that my sentences don't sound like lists?

- ➢ Have I thought about the way readers prefer to receive information? (no ambiguity, no back referencing, everything in chronological order)

- ➢ Have I checked my grammar (infinitive, gerund, allow, thus etc.) with regard to how I outline how and why I made certain choices?

- ➢ Have I checked my journal's guidelines on how to use numbers?

- ➢ Have I used tenses correctly? PAST SIMPLE (in the passive form to describe what I did), PRESENT SIMPLE (descriptions of established scientific fact or processes, software applications, standard devices etc)

How should I structure the Results?

The Results should answer the following questions.

1. What did I find?
2. What did I not find?
3. What did I find that I was not expecting to find? (e.g. that contradicts my hypotheses)

A typical structure is to follow the order you used for the protocols or procedures in your Methods. You then use figures and tables to sequence the answers to the above questions.

Alternatively, before you begin writing, arrange your figures (tables etc.) in the most logical order for your readers. This order should support the initial aim or hypothesis that you stated in

your Introduction. Then associate key findings with each of your figures, excluding any results that are not relevant in supporting your research hypothesis. Note that 'not relevant' does not include results that contradict your hypothesis.

The rest of the section then consists in commenting on these figures one by one. Maeve O'Connor in her book Writing Successfully in Science, recommends the following structure.

1. Highlight those results (including those from controls) that answer your research question
2. Outline secondary results
3. Give supporting information
4. Mention any results that contradict your hypothesis and explain why they are anomalous

Very important: Whatever structure you use, throughout your results section you MUST make it clear when you are talking about your findings and not the findings of others. To learn about this extremely important aspect.

How should I begin the Results?

There are two typical ways to begin the Results. The first is to give a general panorama of your surveys, experiments etc. without repeating the details you gave in the Methods section, as in the three examples below:

Overall, the results presented below show that … The three key results of this empirical study are: …
The following emergent themes were identified from the analysis: …

The most common way is to simply go directly to your results, often by inviting readers to look at one of your figures or tables, either in the first sentence or very shortly after:

What tenses should I use when reporting my Results?

Your results are things that you found before you started writing the paper. They therefore relate to past events, consequently the PAST SIMPLE is used to report them, often in a mixture of the active and passive forms.

You may occasionally wish to use the PRESENT SIMPLE. This is the case when you are taking the reader through your results as if you were a professor at the white- board and your reader was a student in the class. If you opt for this style, which – where possible I would avoid, it needs to be absolutely clear that you are talking about your own results and not someone else's.

What style should I use when reporting my Results?

When describing your results you may opt for an impersonal style. This style, in the mind of some editors, serves to add an element of objectivity to your findings. For instance, instead of saying

S1. We found that doctors viewed the NHS as having failed to provide adequate services.

You could say:

S2. There was a perceived failure of the NHS to provide adequate services.

However, both S1 and S2 are accepted styles. S3 is an example of an impersonal style.

S3. Three levels of feedback were looked at for differences on task persistence. Differences between positive, negative, and no feedback conditions, were minimal and showed no significant findings … There were larger differences both between genders and in the interaction between gender and feedback conditions. Tables 1 and 2 show the averages for these gender differences.

In S3, note how the author uses the passive (were looked at) rather than the active (I / we looked at). This usage may either reflect the author's wish to remain in the background and let his results speak for themselves, and / or because he is following his journal's requirements. However, he uses the active when referring to figures and tables.

Is it OK if I use a more personal style?

Here are some extracts from a Results section in a paper by economist, Andrea Mangani, regarding differences in content between online and print newspapers in Italy. The extracts highlight a much more personal style of reporting results:

Collecting the data was quite difficult … On the other hand, the statistical analysis is rather simple. Table 2 shows … Notice that the difference between online and print variety increases during the daytime; this means that the diversity in online content tends to decrease from 09.30 to 17.30. We wondered whether the smaller degree of online variety depended on …

This kind of writing is less formal and helps the reader to become more involved in the research process. Andrea tells readers not of his difficulties in collecting the data, but the ease with which he managed to analyze these data. He draws his readers' attention to the significance of his data (Notice that …). His readers are also involved in his thought and decision processes (we wondered whether). The result is a paper that reads a little like a story, and is much more enjoyable to follow and therefore easier to digest.

Two more things to note:

- Andrea uses the PRESENT SIMPLE when interpreting his data (online content tends to decrease). This is very common when referring to data that clearly indicate a certain trend.

- Although Andrea was the sole author of the paper and conducted the research entirely by himself, he refers to himself as we. This is quite common in some journals where the use

of the first person singular (I) is considered too informal.

Andrea's reader-friendly style may also be appropriate in the Discussion section.

Should I report any negative results?

Yes! Of course!

Dr Ben Goldacre, a campaigner against the suppression of negative data in medical papers, says:

When you get a negative result, it feels as if it's all been a bit of a waste of time. It's easy to convince yourself that you found nothing, when in fact you discovered a very useful piece of information: the thing that you were testing doesn't work.

In a book published in 1988 and entitled What do you care what other people think? Nobel Prize winner, Richard Feynman wrote:

If you are doing an experiment, you should report everything that you think might make it invalid – not only what you think is right about it: other causes that could possibly explain your results.

To learn how to deal with negative results see Chapter 9.

How can I show my readers the value of my data, rather than just telling them?

Ken Lertzman, a Professor of Ecology at the Simon Fraser University, gives the fol- lowing advice in an excellent document available for download.

Rather than telling the reader that a result is interesting or significant, show them how it is interesting or significant … show the reader what they need to know to come to their own conclusion about the result.
Ken gives two examples to highlight the difference:

S1. *The large difference in mean size between population C and population D is particularly interesting.
S2. While the mean size generally varies among populations by only a few cm, the mean size in populations C and D differed by 25 cm. Two hypotheses could account for this, …

In S1, the adjective interesting means something very definite for the author, but not for the reader who has not been given the tools to assess why the mean size is interesting. Such descriptive adjectives (interesting, intriguing, and remarkable) are rarely helpful.

You need to give your readers sufficient information for them to be able to say to themselves: "wow that is interesting!" This is what S2 does by highlighting specific details (differed by 25 cm).

Adverbs such as interestingly, intriguingly, remarkably also suffer from the same problem. However, they can be used effectively if used at the beginning of a sentence, in order to attract attention to a key finding. So S2 becomes S3:

S3. Interestingly, while the mean size generally varies among populations by only a few cm, the mean size in populations C and D differed by 25 cm.,

However this technique should be used only once or twice in the whole paper, otherwise it loses its effect.

If you have a Discussion section, then you do not need not to interpret your data in the Results.

S1 and S2 are taken from the biology Website of Bates College in Maine, USA.

S1. The duration of exposure to running water had a pronounced effect on cumulative seed germination percentages. Seeds exposed to the 2-day treatment had the highest cumulative germination (84%), 1.25 times that of the 12-h or 5-day groups and four times that of controls.
S2. The results of the germination experiment suggest that the optimal time for running-water treatment is 2 days. This group showed the highest cumulative germination (84%), with longer (5 d) or shorter (12 h) exposures producing smaller gains in germination when compared to the control group.

In S1 the authors highlight the trend / difference that they want the reader to focus on, no subjective interpretation is given. S1 is thus suitable for a Results section. On the other hand, in S2 the reference to optimality is a conceptual model to which the observed result is then tied. S2 is the most suitable for the Discussion.

How should I comment on my tables and figures?

Dr Lertzman has similar ideas about 'showing not telling' with regard to figures and tables:

When writing Results sections you should use the tables and figures to illustrate points in the text, rather than making them the subject of your text.

Following his advice, S1 should be rewritten as S2.

S1. *Figure 4 shows the relationship between the numbers of species A and species B. S2. The abundances of species A and B were inversely related.

In S1 the author is merely telling readers what they can already see in the figure. S1 forces readers to make their own interpretations, which may be interpretations that you don't want them to make.

S2 is much more helpful, because it focuses on the meaning that can be inferred from the figure. S2 saves readers from making any mental effort and at the same time guides them

towards the interpretation that you want them to have.

Compare S3 and S4, and S5 and S6: note how S4 and S6 don't force the reader to read the obvious.

S3*. We can see from Table 2 that in the control group, values for early adolescence (13–15) were 6.5. On the other hand, values for mid adolescence (16–17) were 6.7.
S4. Values for early adolescence were lower than for mid adolescence: 6.5 versus 6.7 (Table 2).
S5*. Figure 1 shows that levels of intolerance are 9, 15 and 20 during early, mid and late adolescence, respectively.
S6. Levels of intolerance are highest during late adolescence.

Lack of conciseness is a frequent problem when describing data in figures and tables. Avoid phrases such as can be seen and we can see. Simply put the figure or table reference in brackets at the end of the sentence. S5 also repeats information that should already be contained in the table, i.e. the respective age ranges for the three stages of adolescence.

What more do I need to know about commenting on tables?

Below is a table from Wikipedia showing some statistics on the famous World Cup semi-final in which Brazil lost to Germany.

A typical mistake is to repeat information from the table. For example:

S1*. As shown in the table, the total number of goals scored was one on the part of the Brazilian team and seven by the German team. The Brazilians achieved 18 shots, whereas the Germans accounted for a lower number of shots, namely 14.

The type of commentary in S1 adds no value to the reader. It tells them nothing that they could not have deduced for themselves. When commenting on a table, your job is to:

- interpret / discuss the results
- bring to the reader's attention anything that is particularly meaningful or significant
- add further details that help to explain the results or which enable them to be compared with previous results

For example, you could write:

S2. Although a close match was expected – both teams had reached the semi-final undefeated – the result was a shocking loss for Brazil. For what was the first time in football history, Germany scored four goals in the space of six minutes. Despite achieving a greater number of shots, having 4% more possession and committing less fouls, and having only two shots less on target, the Brazilians were humiliated. This result recalls the 1952 final when Brazil were

defeated by Uruguay.

Note that given that this is the Results section, you should reserve detailed interpretations for the Discussion section.

What about legends and captions?

A typical mistake is to repeat word for word the caption / legend to your figures and tables within the main text. Legends should have a number. They should be as short as possible and be sufficiently detailed to enable your readers to understand the figure or table without having to read your text. It is vital that you pay attention to legends as some readers may only look at your figures and tables, without even reading the paper itself!

The rest of this subsection is taken directly from the biology website at Bates College – a special thanks to Greg Anderson for allowing me to reproduce it. Although Greg's advice relates to biologists, much of it is true for other hard sciences as well.

Every figure and table included in the paper MUST be referred to from the text. Use sentences that draw the reader's attention to the relationship or trend you wish to highlight, referring to the appropriate Figure or Table only parenthetically:

Like the title of the paper itself, each legend should convey as much information as possible about what the Table or Figure tells the reader:

- What results are being shown in the graph(s) including the summary statistics plotted?
- The organism studied in the experiment (if applicable),
- Context for the results: the treatment applied or the relationship displayed, etc.
- Location (ONLY if a field experiment),
- Specific explanatory information needed to interpret the results shown (in tables, this is frequently done as footnotes)
- Culture parameters or conditions if applicable (temperature, media, etc.) as applicable.
- sample sizes and statistical test summaries as they apply.

How much methodology and results are reported in the legends is journal specific. Hot-off-the-press journals like Science and Nature limit the body text so that virtually all of the Methods are presented in the Figure and Table legends or in footnotes. Much of the results are also reported in the legends.

My research was based on various surveys and interviews. How should I report quotations from the people we interviewed?

Generally speaking:

- There is no need to translate / report word for word what your interviewees said
- Your transcript should simply enable the reader to understand the core points the interviewee made
- even if the sentence uttered by the interviewee was not complete, if appropriate you can complete it if it was obvious what he/she wanted to say
- remove any tangential / irrelevant phrases
- remove any filler words – I mean, in other words, that is to say, you know, um, err

However, you should ignore all the above points if the whole purpose of the interview was to report the exact words that were said, e.g. for some linguistics research.

The quotes you provide need further discussion – otherwise the reader is left to make their own interpretations and to try to make sense of the quotation.

What else do I need to be careful about when reporting data?

Look at the following text entitled Postdocs and the science of being expendable, which reports on the difficulties encountered by postdoctoral researchers when entering the labor market. Can you see a problem?

Postdoc status is highly inflated: its supposedly "academic and cultural value" is not mirrored by the real price "investors" are willing to pay for it. The current system is designed to get cheap AND specialized labour. The average annual salary for neo postdoctoral researchers is about $44,000 in the US, while stipends vary greatly in European countries with an average of 1,500 euros/month for Italian scientists vs 4,560 euros/month pay for their Dutch counterparts.

The problem is that the author has given an annual value in dollars, followed by two monthly values in euros. This makes it hard for the reader to make a comparison (it would have been helpful to have the equivalent annual salary for postdocs in Europe, which is significantly less than in the US and is, at the time of writing, €30,000).
Also, is the author comparing two identical situations? Are neo postdoctoral researchers the same as scientists? And are a salary and stipend the same thing? How can the reader be sure?

Finally, a very punctilious editor might comment that a symbol ($) is used when referring to the US dollar, but not when referring to the euro.

Summary: How can I assess the quality of my Results section?

To make a self-assessment of your Results section, you can ask yourself the following

questions.

- Have I expressed myself as clearly as possible, so that the contribution that my results give stands out for the referees and readers?

- Have I limited myself to only reporting the key result or trends that each figure and table conveys, rather than reiterating each value?

- Have I avoided drawing conclusions? (This is only true when the Results is an independent section)

- Have I chosen the best format to present my data (e.g. figure or table)? Have I ensured that there is no redundancy between the various figures and tables?

- Have I ensured that my tables of results are comprehensive in the sense that they do not exclusively include points that prove my point?

- Have I mentioned only what my readers specifically need to know and what I will subsequently refer to in the Discussion?

- Have I mentioned any parts of my methodology (e.g. selection and sampling procedures) that could have affected my results?

- Have I used tenses correctly? PAST SIMPLE for your findings (in the passive form), PRESENT SIMPLE (descriptions of established scientific fact)

UNIT-IV

WRITING SKILLS

The primary aim of a discussion is to highlight the level of innovation of your research. Basically, it justifies why you wrote the paper. Thus, along with the Abstract, it is generally the most important section in the paper.

In the Discussion / Conclusions it is essential to:

- Be clear what YOU did and what other authors have done
- Highlight your UNIQUE contribution
- Discuss LIMITATIONS of your findings
- State what the applications and implications of your research are

Think about the answers to these questions.

1. What is your most important finding?
2. Why is it so fantastic?
3. How does it compare with similar findings made by other researchers? What are its advantages and disadvantages?

Write one paragraph highlighting your finding. This task should help you focus on what really is important about your research.

People read papers in different ways. Readers in a hurry may read the title and then just look at the figures! Many begin from the part that they find the most interesting, which is often the Discussion.

Most authors find discussing their results to be the most difficult part of the paper to write. When referees reject a paper, it is very often due to a poorly written Discussion. As one of my PhD students commented:

It is a ‘grey zone’ where I have to express my point of view without a specific or logical ‘grid’. Writing the introduction is easier because you can be really helped by the articles that you have read.

Although there is no grid (i.e. template) in which to insert your own text, there is a general pattern or structure to most Discussions. This chapter is designed to teach you various strategies to simplify the process of discussing your results. You will learn how to structure the Discussion and how to ensure that what you write will satisfy the typical requirements of the referees.

The secret is to sound both convincing and credible at the same time. You can do this by being positive about your own limitations, and constructive when discussing what you believe to be the limitations of others.

Another skill is to interpret your results without repeating them.

Active or passive? What kind of writing style should I use?

In the Discussion, you will constantly be comparing your work with other authors'. In your head you know what you did, and you know what other authors have done. But the reader doesn't. You need to make a very clear distinction, so that in every sentence the reader is 100% clear about whose work.

Passive sentences do not reveal the author of the action and so the reader will not understand if you are referring to your findings or another person. So, to avoid ambiguity, where possible use active sentences.

The table below shows five examples. The first two make it 100% clear to the reader whose work is being talked about. The other three are in order of decreasing clarity. In the final example the reader has no idea whose work is being discussed – this is a very typical mistake in papers and is a very dangerous way of referring to the literature.

How should I structure the Discussion?

The Discussion should answer the following questions, and possibly in the following order. You can thus use the answers to structure your Discussion. This gives you a relatively easy template to follow.

1. What are my most important findings?

2. Do these findings support what I set out to demonstrate at the beginning of the paper?

3. How do my findings compare with what others have found? How consistent are they?

4. What is my personal interpretation of my findings?

5. What other possible interpretations are there?

6. What are the limitations of my study? What other factors could have influenced my findings? Have I reported everything that could make my findings invalid?

7. Do any of the interpretations reveal a possible flaw (i.e. defect, error) in my experiment?

8. Do my interpretations contribute some new understanding of the problem that I have investigated? In which case do they suggest a shortcoming in, or an advance on, the work of others?

9. What external validity do my findings have? How could my findings be generalized to other areas?

10. What possible implications or applications do my findings have? What support can I give for such implications?

11. What further research would be needed to explain the issues raised by my findings? Will I do this research myself or do I want to throw it open to the community?

Whatever your discipline you will need to answer all the questions above, with the possible exception of Question 8 (your findings may only be very preliminary). Whether you answer Questions 8–11 will depend on whether you have a separate Conclusions section, if so, the Conclusions may be a more appropriate place.

It may make sense for you to organize your Discussion following the same sequence as you presented your findings in the Results section. In this case, you discuss each survey, study or experiment, and interpret it within the overall scenario of the problem.

If you are a medical researcher, you will need to follow closely the appropriate guidelines (e.g. CONSORT, PRISMA, MOOSE, STROKE). Even if you are not a medical researcher these guidelines are still incredibly useful and you can find links to them at bmj.com.

What is a 'Structured Discussion'?

Some journals, particularly medical ones, not only have structured abstracts but also have structured discussions. The British Medical Journal (BMJ) reports the following on its website:

Please ensure that the discussion section of your article comprises no more than five paragraphs and follows this overall structure, although you do not need to signpost these elements with subheadings:

- Statement of principal findings

- Strengths and weaknesses of the study

- Strengths and weaknesses in relation to other studies, discussing important differences in results

- Meaning of the study: possible explanations and implications for clinicians and policymakers

- Unanswered questions and future research

Again, by having a clear structure, authors are forced to express themselves more clearly, with obvious benefits for the reader.

The above subsections equally apply to most other disciplines (if you replace clinicians with 'others in my field'). In any case, check out your chosen journal's website to see if they have similar recommendations on how to structure the Discussion.

How should I begin the Discussion?

Below are four possible beginnings for the Discussion of the paper given in 14.6.

1. Remind readers of your goals, preferably in a single sentence:
   One of the main goals of this experiment was to attempt to find a way to predict who shows more task persistence.

2. Refer back to the questions (hypotheses, predictions etc.) that you posed in your Introduction:
   These results both negate and support some of the hypotheses. It was predicted that greater perfectionism scores would result in greater task persistence, but this turned out not to be the case.

3. Refer back to papers you cited in your Review of the Literature:
   Previous studies conflict with the data presented in the Results: it was more common for any type of feedback to impact participants than no feedback (Shanab et al., 1981; Elawar & Corno, 1985).

4. Briefly restate the most important points from your Results:
   While not all of the results were significant, the overall direction of results showed trends that could be helpful to learning about who is more likely to persist and what could influence persistence.

You could begin with any of 1–4 above, or perhaps use them all in combination. Next, you give readers a very brief statement of what you can conclude from your findings. You can then use this statement as a starting point for interpreting your findings and comparing them to what is already known in the literature.

Some experts recommend that you tell a story to help you build up your theory, where your variables, data or findings are like characters in a book. Your job as the author is to explain how these 'characters' relate to each other, and how each one has (or has not) its logical place.

Why and how should I compare my work with that of others?

Dr Greg Anderson and Dr. Donald Dearborn of Bates College (Maine, USA) give the following advice to their students:

You may find crucial information in someone else's study that helps you interpret your own data, or perhaps you will be able to reinterpret others' findings in light of yours. In either case you should discuss reasons for similarities and differences between yours and others' findings.

Consider how the results of other studies may be combined with yours to derive a new or perhaps better-substantiated understanding of the problem.

A good structure for doing this is:

1. Make a general statement regarding your findings
2. Mention another author's work that relates directly to your findings
3. Make a link between her/his work and your work
4. Clearly state how your work differs from her/his work
5. State the conclusions that can be drawn from your results in light of these considerations

The following text is an example of how to compare your work with others in the Discussion. It comes from a paper entitled Exploring Stock Managers' Perceptions of the Human Animal Relationship on Dairy Farms and an Association with Milk Production by Catherine Bertenshaw and Peter Rowlinson.

The authors did a postal survey of 516 UK dairy (i.e. milk) stock managers (i.e. farmers) about how they believed humans could affect the productivity, behavior and welfare of cows and heifers (young female calves that have not given birth). Nearly half said they called their cows by name – such cows had a 258 liter higher milk yield than those who that were not called by their name. About 10% said that a fear of humans resulted in a poor milking temperament.

Below is the beginning of the Discussion section:

(1) Our data suggests that UK dairy farmers largely regard their cows as intelligent beings, capable of experiencing a range of emotions. Placing importance on knowing the individual animal and calling them by name was associated with higher milk yields.
(2) Fraser and Broom [1997] define the predominant relationship between farm animals and their stock managers as fear.
(3) Seventy-two percent of our commercial respondents thought that cows were not fearful of humans, although their reports of response to an approaching human suggest some level of fear, particularly for the heifers. With both cows and heifers this would appear to be greater in response to an unfamiliar human. Respondents also acknowledged that negative experiences of humans can result in poor behavior in the parlor.
(4) Hemsworth et al. [1995] found that 30–50% of the variation in farm milk yield could be explained by the cow's fear of the stockperson, therefore recognizing that fear is important for animal welfare, safety, and production.

In (1), Catherine begins with an overall summary of her key finding and its implications.
In (2) she mentions a previous study (by Fraser) in the same topic area and thus connects her findings with the literature.
Fraser's study gave contrasting results to what Catherine reveals in (3). However, in
(3) Catherine also tries to account for some of what Fraser's found (although …
heifers) and in (4) finds further confirmation of Fraser's findings in another study.

Catherine thus adopts a diplomatic approach in which she questions the findings of other

authors in a constructive way. She uses their results either to corroborate her own results, or to put her results and their results in a new light.

Another useful skill that Catherine uses throughout her Discussion, is that she constantly clarifies for the reader whether she is talking about her findings or those of other authors (Sects. 7.3–7.7), or whether she is just talking in general,

(5) The elaborated responses reported in our postal survey contribute some examples of the capacities of cattle, and this contextual human insight may be useful for developing hypotheses for further study.
(6) Most respondents (78%) thought that cows were intelligent.
(7) However, a study by Davis and Cheek (1998) found cattle were rated fairly low in intelligence. They suggested that the ratings reflected the respondents' familiarity with the animals.
(8) The stock managers in our survey were very familiar with their cattle and had a great under- standing of the species' capabilities, through working with them daily.
(9) Stockpersons' opinions offer valuable insight into this subject, which could enable more accurate intelligence tests to be devised; for example, to test whether cows can count in order to stand at the feed hopper that delivers the most feed.
(10) Hemsworth and Gonyou (1997) doubt the reliability of an inexperienced stockperson's attitudes towards farm animals. Our survey found an experienced workforce (89.5% >15 years).

In (5) Catherine concludes a paragraph by suggesting a future course of action.
(6) is the first line of the next paragraph, so it is clear that the respondents are her respondents and not another author's.

In (7) she uses however to indicate that she is going to give some contrasting information. Her use of they clearly refers back to Davis and Cheek.

In (8) Catherine then clarifies for the reader that she is now focusing on her study. She does this again using our. If she had not inserted the phrase "in our survey", the reader would not know which stock managers she was talking about. Not making this distinction is an incredibly common error in Discussions and leads to total con- fusion for the referee and readers. In the literature our is often used, even if the style of the rest of the paper is impersonal (i.e. the passive is used, rather than we). Using our can be crucial in differentiating your work from others.

In (9), like she does in (5), Catherine makes a mini summary of what she has said in the rest of the paragraph. Her use of the SIMPLE PRESENT (offer) shows that she is talking about all stockpersons – not just those in her study or in Davis and Cheek's study. She also recommends a course for future action.

In (10) Catherine begins a new paragraph to indicate that she is now going to cover another subtopic. Good use of paragraphs is essential in signaling to readers that you are moving on to discuss something different. Catherine begins with a reference to the literature to establish the

new subtopic, and then immediately moves on to her findings to make a contrast between inexperienced and experienced workers.

The rest of her Discussion is structured in a similar manner, in which she provides more conclusive evidence that calling a cow by its name, rather than the problem of fear, is more likely to affect milk production. In each case, she makes it 100% clear to her readers why she has mentioned another person's work and how it relates to her work.

For more on this critical point see Chapter 7 in this book, and 10.3 and 10.4 in
English for Academic Research: Grammar, Usage and Style.

How can I give my interpretation of my data while taking into account other possible interpretations that I do not agree with?

In a paper that won him an Ignobel Prize, Magnus Enquist made a case for the fact that chickens are able to discriminate between good looking and ugly human beings. Here is an extract of the Discussion section of his paper, Chickens prefer beautiful humans.

(1) We cannot of course be sure that chickens and humans processed the face images in exactly the same way.
(2) This leaves open the possibility that, while chickens use some general mechanism, humans possess instead a specially evolved mechanism for processing faces.
(3) We cannot reject this hypothesis based on our data.
(4) However, there are at least two reasons why we do not endorse this argument. First, it is not needed to account for the data. We believe that the existence of a task-specific adaptation can be supported only with proofs for it, rather than with absence of proofs against. Second, the evolutionary logic of the argument is weak.
(5) From observed chicken behaviour and knowledge of general behaviour mechanisms we must in fact conclude that humans would behave the same way with or without the hypothesized adaptation. There would thus be no selection pressure for developing one.

His strategy for anticipating possible objections to his argument is to:

1. Admit that he might be wrong – sentence (1)
2. put forward an alternative interpretation (2)
3. Reiterate that his data could be used to confirm this alternative interpretation (3)
4. Give reasons for not agreeing with this alternative interpretation (4)
5. Propose his own conclusion (5)

How can I bring a little excitement to my Discussion?

Like a verbal discussion, you can make your Discussion quite animated – you can allow yourself to use stronger language and make stronger assertions than you might do in other parts of the paper. You are basically trying to 'sell' your data, but at the same time considering both sides of the issue.

A colleague of mine who is frequently asked to referee papers in his field recommends:

Be upfront about your findings and achievements. In my work as a referee I often have difficulty in understanding how significant the authors feel their work is, and why their findings add value. This is because authors are not explicit enough – they don't signal to me (and the reader) that they are about to say, or are now saying, something important. The result is that their achievement may be hidden in the middle of a nondescript sentence in a nondescript paragraph … and no one will notice it.

By upfront, he means do not be too modest about your findings, and by nondescript he means phrases that do not stand out from the rest of the text. If you really want your contribution to be seen and appreciated, then you cannot use the normal flat phrases that you might use, for example, when describing your materials or methods.

One way to add some passion to your writing, is to use qualitative adjectives (e.g. convincing, exciting, indisputable, undeniable) or quantitative adjectives (huge, massive). Typical powerful nouns that suggest a major step forward are: break- through, advance, leap. These adjectives and nouns can also be used in combination (e.g. a substantial insight, a massive advance).

However, such adjectives and nouns should be used very rarely, otherwise they lose their effect.

Here are some real examples:

S1. These observations provide compelling evidence that a massive black hole exists at the centre of NGC4258.
S2. It can be stated that these experiments have provided undeniable evidence of an autonomic link-up of the limbic area.
S3. The latter finding is particularly important in the sense that it cannot readily be explained sociocultural, thus presenting a new and convincing argument for brain-based etiology of this disorder.
S4. Major changes in the business processes and the organizational models are, of course, indisputable reasons for drastic decisions regarding the information systems used by the organization.

S5. To date no work has been published on the role of circulating miRNAs in breast cancer—an area where, if feasible, their use as novel minimally invasive biomarkers would be an incredible breakthrough in our management of this disease.
S6. The possibility of contributing to change the way we communicate with machines is a very exciting proposition.

My comments below imagine that the authors are describing their own findings or are discussing their own reasoning. However, this does not necessarily reflect how these sentences were in fact used by the authors.

The claim made in S1 is very strong and will certainly attract attention. It could be made softer (weaker) by preceding it with a preliminary statement, as in S2 (It can be stated that).

In S3 the authors back up their claim regarding the finding being particularly important, by illustrating its importance. There is no point in saying that something is important, without telling your readers why it is important.

S4 adds emphasis to the adjective indisputable, by preceding it with of course. This makes the claim appear as if it has already been accepted by the community. The adjective drastic adds extra power to the sentence.

S5 would work well as a final sentence in the Discussion, or in the Conclusions. Basically, it serves to show how the authors' work in one field could be extended to another field where, to date, it has never been used before.

S6 would be a great final sentence to a paper. It leaves readers feeling upbeat, i.e. optimistic and encouraged. It also leaves referees with a positive final impression of your paper, which may even affect their willingness or not to recommend the acceptance of your paper.

It is best to use this kind of emotive language wisely and very infrequently (otherwise it loses its effect). Also, such language may not be considered appropriate in your discipline or in your chosen journal – so check with other papers in your journal.

To learn more on highlighting your contribution, and softening strong claims, see Chapters 8 and 10, respectively.

How can I use seems and appears to admit that I have not investigated all possible cases?

It is crucial to be totally honest and non-misleading as to the status of results.

Let's take the example of a mathematical proof. There may be some cases that you have not checked, i.e. you are making an intuitive claim or guess based on what you have checked so far.

In such cases you can use it appears to be or it seems. Such phrases say exactly the truth, i.e. that something is true for the cases you have checked. You are telling the reader that you intuitively suspect or expect that it could be always true, but you don't claim it. That is what 'appears' means. You make no assertion as to the probability because you have not computed or assessed a probability.

It appears that stochastic processes for which x = y can produce finite dimension values.

This completes the proof of Theorem 1. Note how this enables us to determine all the Xs and Ys at the same time. Thus it seems that some natural hypotheses can be formulated as ..

However, you must make it 100% clear to the reader that, for example, you have not checked all cases, that your sample size was small, and that some external factors may have influenced your results.

What about the literature that does not support my findings – should I mention it?

Yes. Your aim is to be transparent. And don't forget that the reviewers will quickly spot that you have only mentioned other works that support your own – this is one of the main jobs of a reviewer.

How can I show the pitfalls of other works in the literature?

There are three areas to call into question regarding the work of other authors.

- Hypotheses that have never really been tested. You want to test them.
- Other studies have only been conducted very generally or in one specific field. You want to apply this research to a new area.
- Other studies have limitations. You are trying to overcome these limitations.

The important thing when criticizing others' work is not to undermine their credibility. The idea is that if you treat others with respect, they will treat you with respect.

Should I discuss the limitations of my research?

Yes!

It is essential that you inform readers of any limitations to your research or any failures or contradicting data. There is no need to consider these aspects of your research to be totally negative. Your readers will appreciate learning about what went wrong, as this may help them with their own research.

However, don't end the Discussion or Conclusions with your limitations. You want your paper to end on a positive note, so in your final paragraph(s) talk about the benefits and wider applications of your research.

What typical problems do researchers in the humanities have when writing the Discussion?

Below is an extract from a reviewer's comments on a social sciences paper. The words in italics are mine.

The authors overstate the findings, making large leaps to what the implications of the study are which really only show that knowledge influences attitudes and behaviour influences willingness to behave. … In fact, most of what is included in the discussion is an overstatement of the results with no support from the literature, and thus should be deleted with a new discussion written that focuses on the actual findings and what they mean. Another issue I have with this paper is that there is no presentation in the results of what was actually found. … If this had been explored in this paper, I believe the paper would have been strengthened and then the authors would have had more ability to draw conclusions about what programs or policies

would be useful for …

In sciences such as chemistry, physics and biology, researchers usually have relatively clear findings that they can present and explain, and for which they can hypothesize implications.

In the humanities, findings are not so clear and are often based on subjective questionnaires and the impressions of the researchers in relation to these questionnaires. Don't fall into the trap of drawing bigger conclusions than are in fact reasonable.

The reviewer above is suggesting the following approach:

- state your findings clearly, i.e. what you really found and not what ideally you would have liked to have found

- on the basis of these findings, discuss what you believe the implications of these findings are (for example, for policy makers, managers, and others who might be doing research in a similar field)

- support your discussion by making comparisons with the literature (i.e. the literature that you presented in the Introduction) – and not just the literature that supports your views!

How long should the Discussion be?

Find the most cited papers in your field, and note the proportion of space given to the Discussion relative to the other sections. Adopt the same proportion.

How can I be more concise?

After the Abstract, the Discussion is generally the most important section in the paper. This is where you highlight for the reader what you have achieved and what it all means in the context of the state of the art. So it is very important that you present this information as concisely as possible. Compare these two versions of the same sentence:

S1. Furthermore, PCB 180 has been reported to share several toxicological targets with dioxin-like compounds [Ref. 1]. Hence, it appears reasonable to assume that PCB 180 may affect the AhR pathway in pituitary apoptosis. In fact, the involvement of the AhR pathway in the regulation of apoptosis has been recently reported [Ref. 2]. The contents of the PCB were in agreement with the results of Chad et al [Ref. 3] and similar to those reported by Jones [Ref. 4].
S2. Furthermore, PCB 180 shares several toxicological targets with dioxin-like compounds [Ref. 1]. Hence, PCB 180 may affect the AhR pathway in pituitary apoptosis. In fact, the AhR pathway may be involved in the regulation of apoptosis [Ref. 2]. The PCB contents were in agreement with Chad et al [Ref. 3] and similar to Jones [Ref. 4].

S2 is a third shorter than S1, but with no loss of detail. If your Discussion was originally three pages long, then in theory you could save one page by removing redundancy (Chapter 5).

The problem with S1 is that you are forcing readers to read the same phrase (has been reported) or a similar phrase (reported by, the results of) again and again. Other phrases that you may be able to remove are: it has been suggested / proposed that …, it is well known that …

Such redundancy may cause the reader to read with less attention, and thus they may miss the important points you are trying to make.

The modal verb may in S2 already incorporates the phrase it appears reasonable to assume that …, so the latter phrase is probably redundant. However, if you are deliberately trying to be cautious, then you could write: we believe that PCB 180 may …

You can massively improve the structure and the language you use in your Discussion by analyzing how other authors in your field write their Discussion sections – but only choose papers from high impact journals.

How long should the paragraphs be?

Your aim is to allow your reader to quickly understand how your results add to the current state of the art.

As with the Introduction (see 14.9), your Discussion should thus not be one long paragraph or a series of very long paragraphs.

The moments to begin a new paragraph in the Discussion are when you:

- Change topic, or you look at a different aspect of the same topic
- Move from talking about one result to another result
- mention another author with similar or different results
- justify any differences between your work and the literature
- want to talk about the consequences of what you have just been describing
- talk about the limitations of your work
- talk about the implications of your study and any future research lines
- draw conclusions

However, for some of the points above you will certainly need more than one paragraph. Consider having a series of sub-headings within the Discussion, and under each heading you can have one or more paragraphs.

If you print your Discussion you will immediately see the undesirable effect of having long

paragraphs. They are not inviting for the reader.

How should I end the Discussion if I have a Conclusions section?

Discussion sections which also have Conclusions may end as follows:

- Tell your readers if and how your findings could be extended to other areas. But you must provide evidence of this. If you repeated your experiment in a different context, would you get the same result?
  We only used a limited number of samples. A greater number of samples could lead to a higher generalization of our results …
  Although this is a small study, the results can be generalized to … Our results may hold true for other countries in Asia.

- Suggest ways that your hypothesis (model, device etc.) could be improved on.
  We have not been able to explain whether x = y. A larger sample would be able to make more accurate predictions.
  A greater understanding of our findings could lead to a theoretical improvement in …

- Say if and / or why you ignored some specific areas.
  Our research only focuses on x, whereas it might be important to include y as well. In fact, the inclusion of y would enable us to …
  We did not pay much attention to… The reason for this was …

- Admit what you have not been able to do and as a consequence cannot pro- vide conclusions on.
  Unfortunately, our database cannot tell the exact scale of Chinese overseas R&D investment. Consequently we cannot conclude that …

- Reiterate your reasons for choosing your topic of investigation in order to convince your readers of the validity of what you have said in the Discussion.
  As mentioned in the Introduction, so far no one appears to have applied current knowledge of neural networks to the field of mass marketing fraud. The importance of our results on using such networks thus lies both in their generality and their relative ease of application

How should I end the Discussion if I do not have a Conclusions section?

Whether or not you have a Conclusions section, your Discussion should end with a summary of the main points you want your readers to remember.

Catherine Bertenshaw concludes her Discussion (18.6) in the classic way by stating:

- What her findings imply
  The attitudinal information from our survey shows that farmers hold cows in very high regard.

- What her recommendations are
  These results create a positive profile of the caring and respectful attitudes of UK farmers to their stock, and this image should be promoted to the public.

- How her research could be continued
  A 56% response rate suggests the respondents are a good representation of UK stock managers. Further on-farm interviews, observations, and animal-centered tests are needed to confirm the inferences made from the data collected in this postal survey.

Many Discussions end in the same way as Catherine's, particularly those that have no Conclusions section. Catherine's paper does in fact have a Conclusions section, but it is only 70 words long and provides an overall summary of her data, and what she thought the implications of her findings might be.

Summary: How can I assess the quality of my Discussion?

When you have finished writing your Discussion, it is a good idea to make sure you can honestly answer 'yes' to all the questions below. This will enable your peers to make a critical assessment with regard to the strengths and weaknesses of (a) how you carried out your research (b) and how you analyzed your findings. The result will be that you will be seen as a credible researcher.

- ➢ Is my contribution to the knowledge gap clear? Have I underlined the significance of my findings? Have I related my findings and observations to other relevant studies?

- ➢ Have I explained what I believe to be new and important very clearly but with- out exaggerating? Have I ensured that I have not over-interpreted my results (i.e. attributed interpretations to them that cannot actually be supported)?

- ➢ Have I truly interpreted my results, rather than just reiterating them? Have I shown the relationship (confirmation or rejection) between my results and my original hypothesis? Have I generated new theory rather than simply giving descriptions?

- ➢ Is there a good balance, rather than a one-sided version? Have I really offered alternative explanations?

- ➢ Have I clearly distinguished fact from speculation? Will the reader easily be able to understand when I am merely suggesting a possible interpretation rather than providing conclusive evidence for something?

- ➢ Have I ensured that there is no bias in my research? (i.e. I have not hidden any of my data or any unexpected results, simply because they do not confirm what I was hoping to find)

Conclusions should synthesize the results of your paper and separate what is significant from what is not. Ideally, they should add new information and observations that put your results in perspective. Here's a simple test: if somebody reads your conclusions before read- ing the rest

of your paper, will they fully understand them? If the answer is yes, there's probably something wrong. A good conclusion says things that become significant after the paper has been read. A good conclusion gives perspective to sights that haven't yet been seen at the introduction. A conclusion is about the implications of what the reader has learned. Of course, a conclusion is also an excellent place for conjectures, wish lists, and open problems.

What tenses should I use?

Many tenses and constructions are used in the Conclusions – the future, conditionals, modal verbs etc. For details on how to use these forms see Chapter 8 in English for Academic Research: Grammar, Usage and Style.

One distinction that many authors make is between what they did during the research (SIMPLE PAST) and what they did during the writing process of the manuscript (PRESENT PERFECT).

We have described a method to extract gold from plastic. We used this method to extract 5 kg of gold from 50 kg of plastic. We found that the optimal conditions for this process were …

The first verb (have described) says what the authors have done in the paper, whereas the second and third verbs (used, found) say what they did in the laboratory (i.e. a finished action).

The following two sentences are incorrect because they use the present simple instead of the PRESENT PERFECT:

S1. *In this paper we consider the robust design of an extractor for removing gold from plastic.
S2. *In this study, it is demonstrated that by using an ad hoc extractor gold can be easily removed from plastic.

S1 and S2 would be correct in the Abstract or Introduction.

How should I structure the Conclusions?

The Conclusions section is not just a summary. Don’t merely repeat what you said in the Abstract and Introduction. It is generally not more than one or two paragraphs long. A Conclusions section typically incorporates one or more of the following:

1. A very brief revisit of the most important findings pointing out how these advance your field from the present state of knowledge

2. A final judgment on the importance and significance those findings in terms of their implications and impact, along with possible applications to other areas

3. An indication of the limitations of your study (though the Discussion may be a more appropriate place to do this)

4. Suggestions for improvements (perhaps in relation to the limitations)

5. Recommendations for future work (either for the author, and/or the community)

6. Recommendations for policy changes

The order these items appear is likely to be the same as suggested above.

It differs from the Abstract and Introduction as you are making a summary for readers who hopefully have read the rest of the paper, and thus should already have a strong sense of your key concepts. Unlike the Abstract and Conclusions it:

- does not provide background details
- gives more emphasis to the findings (Point 2)
- Talks about limitations, which are not normally mentioned outside the Discussion and Conclusions (Point 3)
- covers three additional aspects (Points 4–6)

On his department's excellent website (see References), Dr Alan Chong of the Faculty of Applied Science and Engineering at the University of Toronto, comments:

Students often have difficulty writing the Conclusion of a paper because of concerns with redundancy and about introducing new ideas at the end of the paper. While both are valid concerns, summary and looking forward (or showing future directions for the work done in the paper) are actually functions of the conclusion. The problems then become (1) how to summarize without being completely redundant (2) how to look beyond the paper without jumping completely in a different direction.

The rest of this chapter is dedicated to solving Dr Chong's first problem. The second problem is not a language issue and simply involves making sure that you avoid developing any new directions in significant detail, and that these future avenues should be clearly linked to the work described in your paper.

How can I differentiate my Conclusions from my Abstract?

These two sections have completely different purposes. The Abstract is like an advertisement for your paper – it has to attract the reader's attention. On the other hand, the Conclusions section is designed to remind readers of the most salient points of your paper. However, the Conclusions also have to add value. This added value is typically contained in the recommendations, implications and areas for future research.

In any case, it is a good idea to revise the Abstract and Conclusions together, and even shift information from one to the other.

There will be some overlap between the two sections, but this is both accepted practice and inevitable.

How can I increase the impact of the first sentence of my Conclusions?

Here are some typical first sentences for the Conclusions section.

We have here described a model for understanding the power of brainwashing in certain 'life-changing' courses … We have found significant evidence of …

In this paper we have presented a statistical study of the nature of … We have shown that it is possible to reason about …

In this paper it has been shown how critical thinking should become a core subject even in elementary schools … A novel approach has been introduced to …

In this work it has been attempted to analyze loop bending in hip hop … It has been shown that for…

The present study is an attempt to understand whether homeopathic medicines can cure neuroses in dogs.

The parts in italics will have zero impact on either the referee or the reader. They also match the equally uninteresting first sentences often found in Abstracts (13.8).

The last one (the present study is ...) even looks like the beginning of an Abstract, and could simply be replaced by We estimated (i.e. using the past tense).

Just as professional copy editors advise against beginning a paper with This paper describes, they also suggest avoiding ending the paper in the same way (This paper has described). This is because such phrases:

- waste a lot of words (5–7 words that tell the reader nothing)
- delay the main topic
- are not memorable for the reader and have no impact

It is not difficult to be more direct and concise, as the following examples show.

I don’t have any clear Conclusions, what can I do? Should I mention my limitations?

Sometimes it is impossible to leave the reader with clear conclusions regarding the contribution of your work – maybe your method turned out to be inappropriate and your results were not as brilliant as you were hoping for! In such cases simply say what you have learned about the problem and then suggest possible lines of future research. Such a final section is generally

entitled concluding Remarks.

If you don't have any clear conclusions, it is important not to present your findings in an exaggerated light or to say something uninteresting or irrelevant. Readers may still be able to benefit from what you found (or equally important, did not find) – see Chapter 9. In order to present inconclusive conclusions you may benefit from using hedging devices (Chapter 10).

Here are some examples of authors admitting that their work did not achieve all that they had hoped for. In some cases readers are immediately warned of this 'failure' through the use of the words highlighted in italics.

Unfortunately, we could not assess how much of the difference in outcome was due to ..

When results are compared across different components, the confidence intervals overlap, and we have no conclusive evidence of differences in …

Although some progress has been made using our model, this incremental approach pro- vides only a partial answer

Unfortunately this trial had too few subjects to achieve sufficient power and had a low … It is also unclear what conclusion should be drawn …
Regrettably, we did not have the means to …
To make your Conclusions not sound too negative, you can add some hope for the future.

Although it is too early to draw statistically significant conclusions, two patterns seem to be emerging …

However, more definite conclusions will be possible when … Nevertheless, our study confirms recent anecdotal reports of … Despite this, our work provides support for …
In any case, we believe that these preliminary results indicate that …

Again, the first words of the sentence alert the reader that you are now going to qualify the negative stuff you said before by offering some optimism. You could also use some conditional sentences to show what might have been possible if you had had different circumstances, or what might be possible in the future.

If we had managed to … then we might have been able to … If we manage to … then we might be able to.

How should I relate my limitations to possible future work?

Don't attempt to lessen the negative impact of the limitations of your research (see Chapter 9) by simply claiming that these limitations could be solved in 'future work'. Referees and editors can quickly see through this strategy and thus dismiss your claims as being unfounded or vague. Instead, you need to give some details regarding how they could be solved.

Below I will examine three examples of very poor paragraphs describing limitations and future work. The italics are mine.

EXAMPLE 1 Although we obtained meaningful results, the present study is not without limitations, which must be addressed in future research. First, the causal relationships in our test model could be reversed by cross-sectional research. Future studies may employ experimental and longitudinal designs to evaluate the causality implied in our model. Second, the samples used in the study are only from Mainland China. We should take care when generalizing these findings to other cultures.

The referees of Example 1 might ask themselves:

1. Who is supposed to address the limitations - the author or the community?

2. Why 'must' they be addressed (must sounds very strong)?

3. Why has the author used May (which indicates a 50-60 % probability) in real- tin to future studies?

4. Who does we refer to - the author or the community?

5. Why should we 'take care' and why should the findings be generalized?

6. What kind of 'care' should we take?

7. If the findings are going to be 'generalized', how might this be done and with what possible outcome?

The main problem with Example 2 is that it seems to have been written in a great hurry and has not been re-read by the author. How? So why does it merit publication now? How can you be so certain? Why? Who exactly are 'inquiring people'? What are the implications of this work? Can the methodology be applied in other areas of the digital humanities?

EXAMPLE 2 Although the research setting of the present research may be considered of little interest from an economic perspective, given the economic performance of the firms in the sample, the relation between the unit of analysis (i.e. learning dynamics) and economic performance is not in the scope of the present research. However, this limitation constitutes a trajectory for further research.

The word research is repeated four times. Repeating key words is a good idea, but research can hardly be considered a key word here. In addition, it is not clear whether the phrase that begins given the economic performance is linked to the previous phrase or the following one - better punctuation would clarify this point. Finally, it is not a good idea to refer to your own research as being of 'little interest' - if you don't think it is interesting, then the referees certainly won't, and they will consequently not recommend that it be published.

Another issue with Example 2, which is also found in the last sentence of Example 3, is that it is extremely vague and sounds rather pompous. The referees are likely to suspect that this vagueness is the result of the author i) not really knowing how to deal with his/her limitations, and ii) the author trying to disguise his/her lack of confidence and belief in his/own work.

EXAMPLE 3 The sample is not representative of social finance institutions currently operating in Europe and, therefore, the results may not be extended to the entire field of social finance. Nevertheless, it includes innovative SFIs providing social finance in Italy and Ireland which have never been included in previous studies. This enhanced our research to analyze alternative financing models and operating structures that may enrich the current debate on social finance.

The last sentence of Example 3 does not make grammatical sense (this enhanced our research to analyze). Given that this sentence may be the last sentence that the referees read, it is going to give a bad final impression. In the first sentence, may not should probably be cannot. Such grammatical errors might well make the referees recommend that the paper be submitted to an English editing service - even if the rest of the paper was written in good English.

An additional problem is that they key finding in Example 3, i.e. social finance for the first time in Italy and Ireland, is lost at the end of a sentence in the middle of the paragraph. If something is important, it should stand out from the text.

So what can you do to avoid these issues?

If you say that your limitations could be resolved in future research, then you need to suggest how such future research might address these limitations:

- If you want to generalize your results to, for instance, another country, then you could state which countries these might be.

- If you state that your sample size was too small and that future work should con- sider a larger sample, then you need to propose ways of increasing the sample size.

- If something is outside the scope of your current paper, but could be dealt with in a future paper, then you should outline two or three ways of exactly how it might be dealt with.

In summary:

- Don’t underestimate the importance of the Conclusions.

- Be as specific as possible. By outlining real concrete possibilities and strategies for the future you will make a much more convincing case to the referees (and readers).

- Re-read everything in terms of checking the correctness of the English.

Imagine you are a very punctilious referee, i.e. someone who shows great attention to detail and will not accept vague unfounded assertions. What questions might referees ask themselves

while reading your Conclusions?

How can I end my Conclusions?

Once you have summarized your work and dealt with any limitations, there are three typical ways to end your Conclusions. You can use one or more of these ways.

The first is to show how your work could be applied in another area.

Our findings could be applied quite reliably in other engineering contexts without a significant degradation in performance.

These findings could be exploited in any situation where predictions of outcomes are needed.

Our results could be applied with caution to other devices that …

Note how the above phrases all make use of could as a hedging device. You might however like to say where they could not be applied for the moment.
However, it remains to be further clarified whether our findings could be applied to …

Further studies are needed to determine whether these findings could be applied to components other than those used for …

The second typical ending is to suggest future work. There is some general agreement that the use of will refers to your own planned work, and that should refers to work that you believe could be addressed by the general community. Thus the following represent the authors' plans:

One area of future work will be to represent these relationships explicitly …

Future work will mainly cover the development of additional features for the software, such as … Future work will involve the application of the proposed algorithm to data from …
On the other hand, these examples show possible lines of research for anyone in this particular field:

Future work should give priority to (1) the formation of X; (2) the interaction of Y; and (3) the processes connected with Z.

Future work should benefit greatly by using data on …

The third way to end your Conclusions is to make a recommendation. The difficulty in making suggestions and recommendations is just in the grammatical construction.

The examples below highlight a construction that may not exist in your language.

S1. We suggest that policy makers should give stakeholders a greater role in … S2. We suggest that policy makers give stakeholders a greater role in …

S3. We suggest that the manager give stakeholders a greater role in … S4. We recommend that stakeholders should be given a great role in … S5. We recommend that stakeholders be given a greater role in …

The construction is thus:

to recommend (suggest, propose) + that + someone or something + should
(optional) + infinitive (without to) + something

The only difference between S1 and S2, and between S4 and S5 is the use and non- use of should – the meaning is identical. S3 highlights that the form of the second verb does not change – in fact, it is an infinitive form (or if you are a language expert). This means that in correct English no third person –s is required, so we suggest that the manager gives is incorrect (but still quite common). S4 and S5 use the passive infinitive (be) + past participle (given).

Finally, be careful not to make any vague assertions:

This effort can therefore be regarded as the first step towards the development of a marine management tool to study present dynamics and carry out scenario studies.

The reviewer of the paper where the above sentence comes from commented that:

Short but clear statements on the applicability of your work elsewhere are needed, as well as the use of your work as a management tool. Merely saying this is a first step is not good enough.

How should I write the Acknowledgements?

The Acknowledgements generally include one or more of the following.

1. Sources of funds.
2. People who gave significant technical help (e.g. in the design of your experiment, in providing materials).
3. People who gave ideas, suggestions, interpretations etc.
4. The anonymous reviewers

It is a good idea to let the people that you wish to acknowledge see the exact word- ing of how you want to acknowledge them – they might think it is too effusive (or occasionally, insufficient).

The style of giving acknowledgements may be quite different from the style of the rest of the paper. For example, you can use the first person (I, we).

Keep your acknowledgements as short as possible, they are generally of little interest to anyone apart from those mentioned.

Summary: How can I assess the quality of my Conclusions?

To make a self-assessment of your Conclusions, you can ask yourself the following questions.

- ➢ Is what I have written really a Conclusions section? (If it is more than 200–250 words, then it probably isn't – it needs to be much shorter)

- ➢ If the conclusions are included in the Discussion, have I clearly signaled to the reader that I am about to discuss my conclusions (e.g. by writing In conclusion …)?

- ➢ Have I given a maximum of one line to comments related to descriptions of procedures, methodology, interviews etc.? (Generally such comments are not needed at all, unless the primary topic of your paper is the methodology itself)

- ➢ Have I avoided cut and pastes from earlier sections? Do my Conclusions differ appropriately from my Abstract, Introduction and final paragraph of my Discussion?

- ➢ Are my Conclusions interesting and relevant?

- ➢ Have I given my Conclusions as much impact as possible and have I avoided any redundant expressions?

- ➢ Have I avoided any unqualified statements and conclusions that are not completely supported?

- ➢ Is my work as complete as I say it is? (i.e. I am not trying to get priority over other authors by claiming inferences that cannot really be drawn at this stage)

- ➢ Have I introduced new avenues of potential study or explained the potential impact of my conclusions? Have I ensured that I have only briefly described these future avenues rather than getting lost in detail?

- ➢ Are the possible applications I have suggested really feasible?

UNIT-V

QUALITY AND TIME MAINTENANCE

Many researchers finish their manuscripts just before (and often after!) the deadline. Due to such pressures of time, they often send their manuscript to the editor without doing a final check. Most manuscripts are written by multiple authors. This involves a lot of exchanges of versions of the manuscripts, with a consequent increase in the possibility of mistakes being introduced. Lots of changes are made at the last minute, and often no one checks them for accuracy in terms of English. One author needs to be responsible for the final check.

Unfortunately, poor English and lack of clarity are one of the most frequent causes of a paper being initially rejected. You will waste several months if you have to resubmit your paper, and in the meantime someone else might publish a paper on the exact same topic!

Bear in mind the following:

- Judge your paper with the same criteria as you would if you had written it in your own native language.
- Double check you have followed the journal's guidelines/instructions for authors.
- Ensure everything is accurate (data, dates, references, bibliography).
- Ensure everything is consistent (US vs GB spelling, punctuation, capitalization).
- It takes much longer for editors and reviewers to read badly-written work than well-presented work. They may not react well.
- Rewriting (which includes cutting) can be a very satisfying as well as being an essential process.
- After weeks or months of working on your paper, you will find it hard to spot your own errors – asks a colleague to help you.
- Consider using a professional editing agency to edit and proofread your work – they will also act as a pre-review by highlighting aspects of the paper that may need reworking. However, if you are not in a hurry to have your paper published, it might be worth waiting to hear the referees' comments before submitting your paper to a professional agency, who can then work on your final version.

Cut, cut, cut and keep cutting

Joseph Addison (1672–1719), English essayist, poet and politician once remarked:

The English delight in silence more than any other European nation, if the remarks which are made on us by foreigners are true. … To favour our natural taciturnity, when we are obliged to

utter our thoughts, we do it in the shortest way we are able.

Imagine that you have been asked by the referee to reduce your paper by 25%. As you go through the paper, cut as much as you can (without necessarily eliminating any content). This very rarely leads to a poorer manuscript, more often it improves it massively.

On the basis of identical content, there is no referee in the world who would prefer to review a paper of twenty pages rather than fifteen.

Make sure you haven't included any sentences or paragraphs just because they sound good to you or you are particularly pleased with the way you have expressed yourself.

Also consider cutting whole paragraphs and subsections.

A few months into the future you will not even remember what you cut. It may seem desperately important for you to include something now, but really ask yourself: Do my readers need to read this? Will they notice if I have cut it out?

Check your paper for readability

Website designers follow the principle of 'don't make me think'. This means that everything should be so clear to visitors to their websites, that these visitors intuitively know where to find the information they need. The visitors are not required to think.

Similarly, writers of technical manuals focus on presenting information in an orderly straightforward fashion that requires minimal intellectual effort on the part of the reader – they want the readers to assimilate the information in a relaxed way, they don't want to make their readers tired and stressed.

Richard Wydick, Professor of Law at the University of California, writes:

We lawyers do not write plain English. We use eight words to say what could be said in two. We use arcane phrases to express commonplace ideas. Seeking to be precise, we become redundant. Seeking to be cautious, we become verbose. Our sentences twist on, phrase within clause within clause, glazing the eyes and numbing the minds of our readers. The result is a writing style that has, according to one critic, four outstanding characteristics. It is "(1) wordy, (2) unclear, (3) pompous, and (4) dull."

You do not want referees and readers to consider your work wordy, unclear, pomp- ous, or dull, so when you make the final check of you manuscript, ask yourself the following questions:

- are my sentences reasonably short? (sentences longer than 30 words are gen- erally hard to assimilate without having to be read twice)

- are my paragraphs reasonably short?

- have I only written what adds value, have I ensured there is no redundancy?
- have I clearly differentiated my work from the work of others so that the referees can understand what I did in relation to what others have done before me?
- have I highlighted my contribution and the gap it fills so that the referees can judge whether my paper is suitable for my chosen journal?

Readability is also affected by the following factors (these are all covered in Part 1 of this book):

- Poor layout: large blocks of text are hard to read, whereas short paragraphs with white space in between them are much easier
- Ambiguity and lack of clarity: the reader is not sure how to interpret a phrase
- Lack of structure: within a sentence, paragraph or section
- Too much abstraction: the reader is not given concrete explanations or examples
- Lack of consistency

Always have the referee in mind

The key factor when revising your paper is to have the referee in mind. Here are two quite typical comments related to poor writing skills.

I often had to defer my interpretation of the meaning of a sentence until I had read it in its entirety. Frequently I got lost in a series of subordinate clauses. The paper would thus benefit from a major revision from a language point of view.

This paper could be improved considerably if the authors gave more consideration to their readers. At times it was difficult to follow the logical connection of the authors' ideas, and on several occasions I was tempted to stop reading completely.

Referees often make a direct connection between the time and effort that an author makes in presenting information, and how much time and effort the author has spent in doing their research. If the information is presented badly, then the implication is that the research may have been conducted badly too. Also it helps to remember that referees make reports on manuscripts in their free time for no financial reward – they are of much more benefit to you, than you are to them! To learn about how reviewers write their reports see Chapter 11 in English for Academic Correspondence.

Check for clarity in the logical order of your argumentation

In English it is considered good practice to state upfront what will be argued in an article and

how. As you re-read your manuscript make sure there is a logical progres- sion of your argument. Don't be influenced by how a paper might be written in your own language. Kateryna Pishchikova, a Doctor of Philosophy in Linguistics, says:

Russians tend to use long and complicated sentences. They often follow a "detective story" logic according to which the reader has to follow the events or arguments as they unfold and will only learn what the author is trying to say at the end. Overall, complexity, and not clar- ity, is synonymous with good scientific or specialist writing.

So check that your key findings are not hidden in the middle of sentences or paragraphs.

Be careful with cut and pastes

If you write your paper in conjunction with other authors you multiply the chances of mistakes and ambiguity. Words such as it, that, this, one, former, latter and which are potentially dangerous if the words they refer to are subsequently changed by another author. For example, imagine Author 1 writes

… Russia, Canada and the United States. In the former …

Then, in order to put the countries in alphabetical order, Author 2 modifies it as follows:

… Canada, Russia and the United States. In the former …

The problem is that the former in Author 1's sentence refers to Russia. But in Author 2's sentence the former refers to Canada. To avoid such mistakes it is always best to repeat the key word rather than using it, that, this, one, former, latter and which. In any case, if it is your job to read the final version of the manuscript it is worth taking such problems into consideration.

For more on sources of ambiguity see Chapter 6.

Make sure everything is consistent

Here is an extract from another referee's report, which again highlights the importance of what you may consider to be fairly marginal issues:

This work is novel and is worthy of publication. However, the presentation of the work is, quite frankly, unprofessional. There are many sloppy mistakes like spelling mistakes and incorrect references, as well as inconsistency such as changing terminology and differences between captions and inline text.

Check that your English is suitably formal

There are certain words and expressions that are considered by most journals to be too informal. Check that your manuscript doesn't contain any of the following (note these are just examples

and do not represent a comprehensive list):

- Contracted forms: doesn't, can't, we'll etc.
- Informal nouns: kids (rather than children)
- Informal adjectives: trendy; prefer topical
- Informal expressions of quantity / size / appearance: a lot, big, tiny, nice
- Informal conjunctions and adverbs: so, till, like; prefer thus, until, such as
- Informal phrasal verbs: check out, get around, work out; prefer examine, avoid, resolve
- going to when will or the present tense could be used
- Use of you

Don't underestimate the importance of spelling mistakes

I cannot overestimate the importance of doing a final spell check as the very last thing you do before submitting your manuscript.

A variation of Murphy's law predicts that last-minute revisions to your work will inevitably contain typos!

Referees have been known to initially reject a manuscript on the basis of incorrect spelling alone (though I suspect that sometimes this is for political reasons!).

In any case, referees do not like to see spelling mistakes, and some may think that there is an implicit relation between not taking time to check your spelling and pos- sibly not checking your data! Make sure you choose the correct version of English – US or UK – corresponding to your chosen journal. Their style guide for authors should in any case tell you which spelling system they require.

Spelling checkers only pick up words that are not contained in their dictionaries. Mistakes and typos like the ones below would not normally be found because they are words that are in the dictionary (though not with the meaning that the author intended).

The company was funded in 2010. (founded)

The samples were weighted and founded to be 100 g. (weighed, found) It was different form what was expected. (from)
We asses the values as being … (assess)

Be careful of: choose / chose / choice, filed / field / filled, from / form, there / their, then / than,

through / trough, use / sue, were / where, with / whit.

Remember that spell checkers tend to ignore words in CAPITALS. Given that sometimes titles of papers and other headings are in 'all caps', you need to double check them.

An additional problem is that your paper may have been written by various people and the language set for the spell checker may vary throughout the text. It should be the responsibility of the person who sends the paper to the editor to ensure that the language is set on English throughout the paper, and that American or British English have been chosen as appropriate.

Regarding US vs GB spelling, don't worry about -ize vs -ise, both forms are used by US and GB authors indifferently (it is only Word that has decided that -ize is US spelling). However, differences such as color /colour, modelled / modeled should be taken into account.

There is a tendency to ignore Word's (and other software's) red underlining of technical words. Just because such words are not in the software's dictionary, does not necessarily mean that you have spelt them correctly.

Spell checkers may not be perfect, but they are very useful. Grammar checkers are also likely to find a few mistakes that you may not have noticed. They will help you find errors connected with subject verb agreement, word order, punctuation (before which and, and with hyphenation between words), unnecessary passive forms etc. Obviously the grammar check can only make suggestions, but Word's grammar check found several mistakes in the draft of this book.

To learn more about spelling see Chapter 28 in English for Academic Research: Grammar, Usage and Style.

Write a good letter / email to accompany your manuscript

If your English is poor in your email, the editor may suspect that the English will be poor in the manuscript too. This is not a good start.
To learn how to write effective emails, see Chapter 13 in English for Academic Correspondence.

Dealing with rejections

Most journals reject large numbers of papers. In general, the higher the impact factor of a journal, the higher the risk of rejection. Don't be demoralized – yours is certainly not the first paper to have been rejected!

The highest ranked journals also tend to have the fastest turnaround and may thus return your rejected paper quite quickly. The benefit to you is that you are likely to be given a peer review of an excellent standard, which should help you to revise your paper before submitting it elsewhere. See rejection as an opportunity for making your paper even better.

To give you an idea of how difficult it is to publish a paper in a top ranking journal, here are

some statistics from the 'Welcome to resources for authors' page of the website of the British Medical Journal (BMJ), one of the world's most prestigious journals.

We can publish only about 7% of the 7,000–8,000 articles we receive each year.

We reject about two thirds of all submissions without sending them for external review.

However there are still advantages of sending your paper to such a journal, even if there is a very high chance of rejection. The BMJ makes very quick decisions (2–3 weeks) so you don't really delay your chances of publishing elsewhere. If they don't even send your paper for external review, it either means your paper is outside the scope of the journal, or that it has some serious flaws in terms of science and/or structure and language. This is a clear indicator that you need to seriously revise your paper. If the BMJ does decide to submit your paper to peer review, the reports you will receive from the reviewers will be very helpful in indicating how your paper can be improved.

Take the editor's and reviewers' comments seriously

There is a tendency to only take into account the editor's and referees' comments that you agree with and to discount everything else. However, if a referee says that he/she cannot understand what you mean, there is a very good chance that readers will have the same problem.

Don't underestimate editors and reviewers when they ask for a 'linguistic revision'. Here is what one editor wrote after the authors revised the technical aspects of their paper but failed to address English language issues:

This new revision does address many of the concerns regarding the technical substance of the manuscript. Unfortunately, the English writing (which the reviewers raised, and which was explicitly listed as requirement #2 in the review summary) continues to be an issue (in fact, the newly revised portions have the most language issues). There are problems with word order, commas, (missing or incorrect) articles, duplicated or missing words, logical inconsistencies, and general grammar issues throughout.

There will therefore need to be yet another minor revision, after which point I hope the manuscript will be in an acceptable state.

Let me stress the fact that improving the writing is *not* optional. If the manuscript comes back with significant remaining language issues, then it will unfortunately have to be rejected.

A tip for using professional editing agencies

If you decide to use the services of a professional editing agency, ensure that you request a certificate that certifies that the English of your manuscript has been edited by a native English speaking editor. You can then send this certificate to the editor along with your manuscript.

This should help you to deal with reviewers whose own English is not sufficiently good to

judge the quality of your English, but who claim that your 'English needs to be revised by a native speaker' maybe because you have a non-English surname.

Summary

- Respect the referee. Don't waste his or her time by submitting a poorly written manuscript
- Get a colleague to read through your paper or use a professional editing service
- Print a hard copy of your manuscript. Don't rely on reading it on screen
- Check for all types of mistakes in English: grammar, vocabulary and spelling
- Apply the same standards as if you had written your manuscript in your own mother tongue.
- Cut as much as you can
- Check your manuscript for readability and logic
- Be careful with problems caused by multiple authors, e.g. cut and pastes
- Ensure you have followed the journal's style guide, e.g. for citing the literature
- Check for accuracy and consistency
- Take editorial comments seriously
- As your last task before sending the manuscript to the journal, do a spell check. Don't rely 100% on automatic spell checkers. Spell checkers do not know the difference between *witch* and *which*, *asses* and *assets*, or *tanks* and *thanks.*