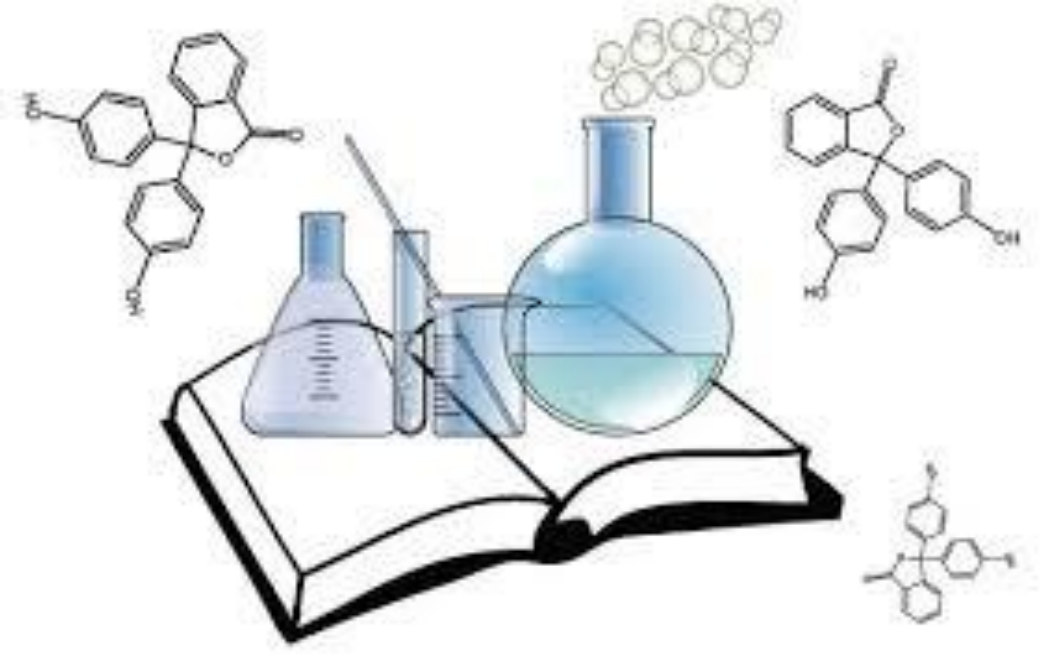
Writing Skills for Science Communication



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Outline

- Scientific writing fundamentals
- Stages of essay writing
- Some specifics of scientific writing
- Academic integrity and referencing

Expectations

- Writing conventions and standards vary across different faculties
- Writing for science is different to writing for other disciplines

Scientific writing is

- **Clear and concise** – no unnecessary words/phrases
- **Simple** – direct language, not vague or complicated
- **Logical** – ideas flow logically
- **Accurate** – quantified, factual statements
- **Objective** – statements supported by evidence

Clarity

The meaning of every word and sentence must be clear.

Not all cases of this illness occur in the presence of a family history and these sporadic cases present some further difficulties to the clinician.

Sporadic cases of this illness that occur in the absence of a family history may be difficult to diagnose accurately.

Scientific writing omits superfluous words.

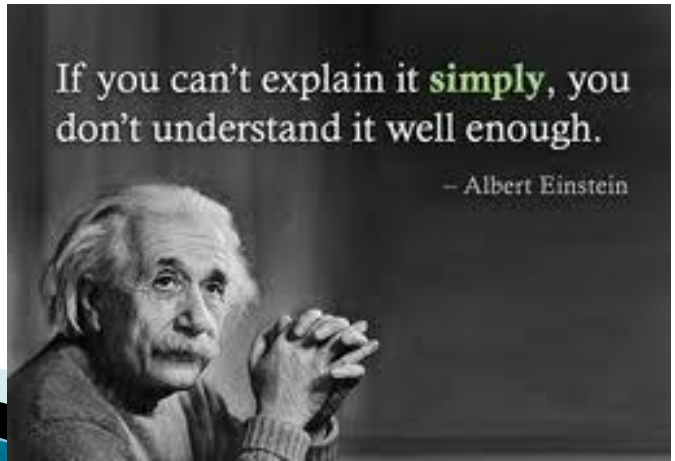
may be the mechanism responsible for	may have caused
various lines of evidence suggest	evidence suggests
showed a tendency to higher survival rate	had higher survival

The KISS principle: Keep it short and simple

Minimum number of words and the simplest words convey meaning

Climate change presents a significant problem to the world and there is much evidence to suggest that climate change negatively impacts on environments.

Climate change is a significant environmental problem.

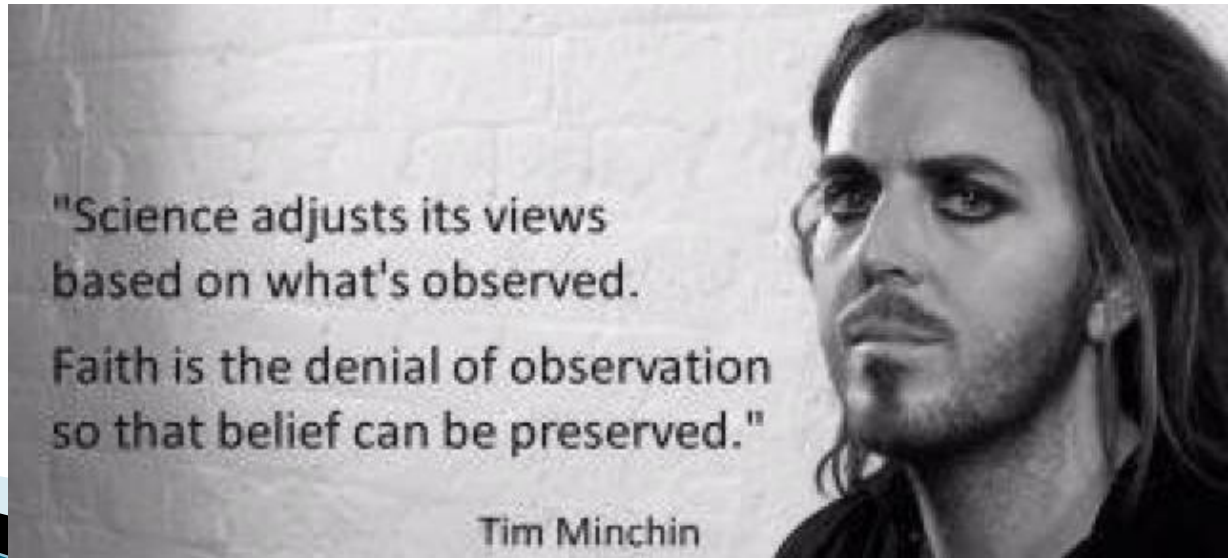


Accuracy

There is no ‘belief’ in science, only proven facts.
Statements must be based on evidence and quantified.

The researchers believe that habitat destruction is having an impact on panda numbers.

Research has shown that habitat destruction is a key factor in declining panda numbers (Smith 1999).



Objectivity

Scientific writing is objective, impartial and clearly states a fact or process.

Elephants are majestic creatures.

Elephants are large, herbivorous mammals.

Six stages of writing an essay

…and partying is not one of them

1. Consider/define the topic
2. Research
3. Plan your essay
4. Prepare a draft
5. Read, revise and edit your draft (as many times as necessary)
6. Proofread

Stage 1
Consider / define the topic

Analyse the essay question
Underline key words and phrases

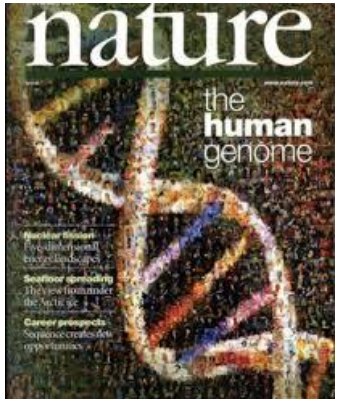
There are usually three parts to essay questions:

1. Content: words that describe the essay topic

2. Directives: words that tell you what to do with the content eg. compare, define, evaluate, explain, critique

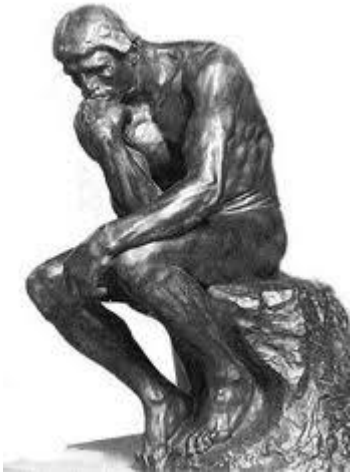
3. Limiters: words that limit the focus of the essay question eg. a particular species, time frame or context

Discuss commercial harvest of kangaroos as compared to culling of kangaroos in the South Australian context.



Stage 2 Research

How credible and reliable is the information?
What authority does the author have to comment on the topic?
Could the author be biased?
Is the research methodology presented?
When was the information published?
Is it still relevant?



Critical Thinking

Critical thinking = Reflective judgement

Critical thinking is rigorous and involves:

- **Interpreting:** understanding significance and clarifying meaning
- **Analysing**: comparing, contrasting and recombining information
- **Reasoning**: developing a logical argument
- **Evaluating**: judging the credibility of information sources

Stage 3
Plan your essay

Brainstorm: What ideas that should be included?

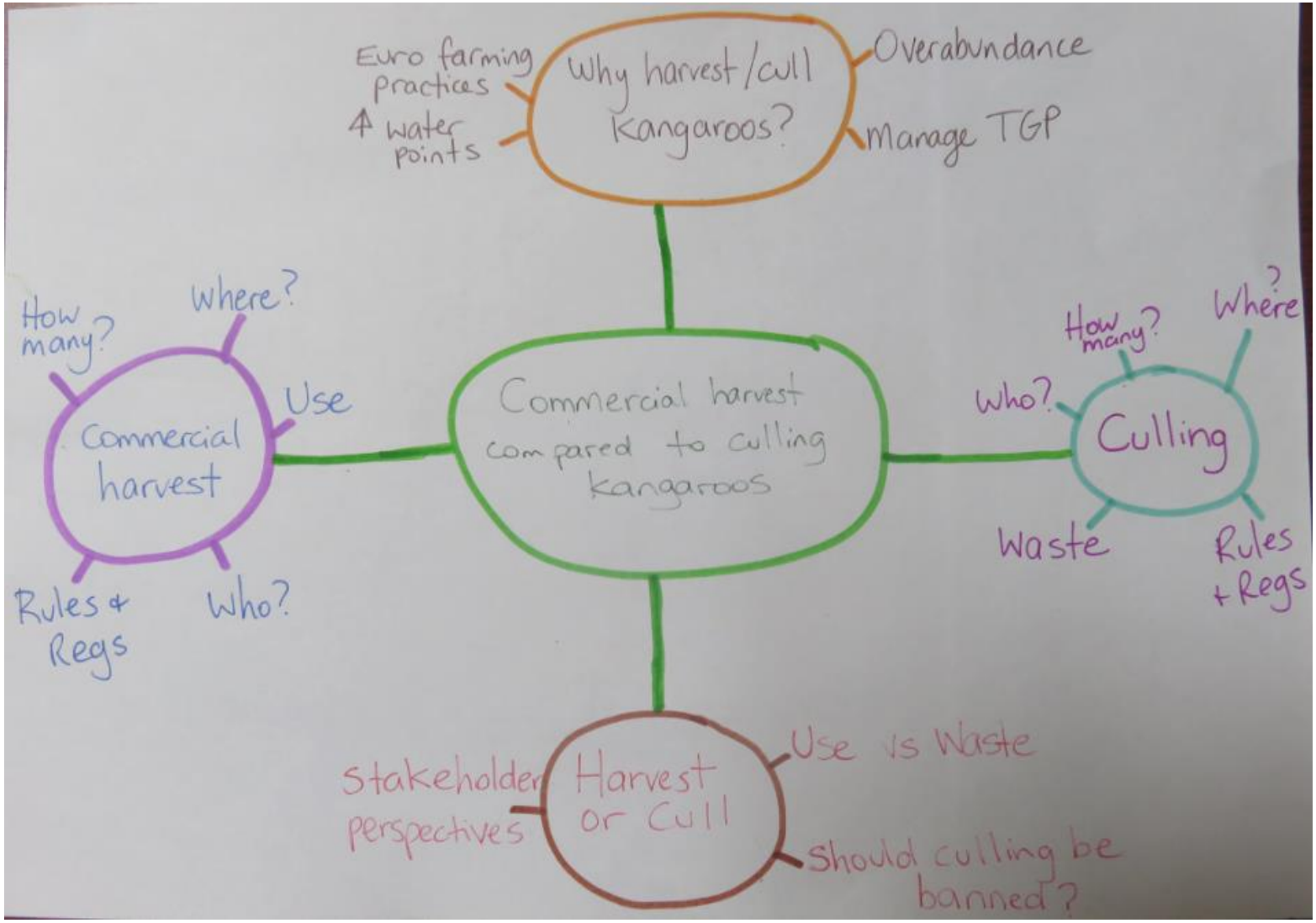
Organise: Group related ideas/topics together

Order: Arrange the ideas/topics in logical order

Detail: For each main idea/topic, what are the key points or elements that need to be discussed?

Create: Make an outline of your essay that includes headings and subheadings

Grouping related ideas together



From here you can develop your essay plan

Stage 4
Prepare a draft

Use the essay plan to prepare a first draft

Introduction: **(Write this last)**
Background information, indicate why the topic is important, state what the essay covers, indicate direction of the essay.

Body: **(Write this first)**
Provides details of the issues/topics, use subheadings, ensure logical flow of ideas

Conclusion: **(Write this second)**
Draw together the ideas/argument presented in the body, summarise main points, no new information

Stage 5
Read, revise and edit your draft

Revision and editing your essay is a critical process, in terms of importance and how you approach the task

Allow plenty of time for the revision and editing process

The more time you put into this stage – the better your grade

Consider:
Have you addressed the essay question/criteria?
Does the essay flow logically, both within and between paragraphs?
Is paragraph structure correct?
Is the meaning of each sentence clear?
Have you referenced information sources accurately?
Is formatting consistent and correct?

Stage 6
Proofread and submit

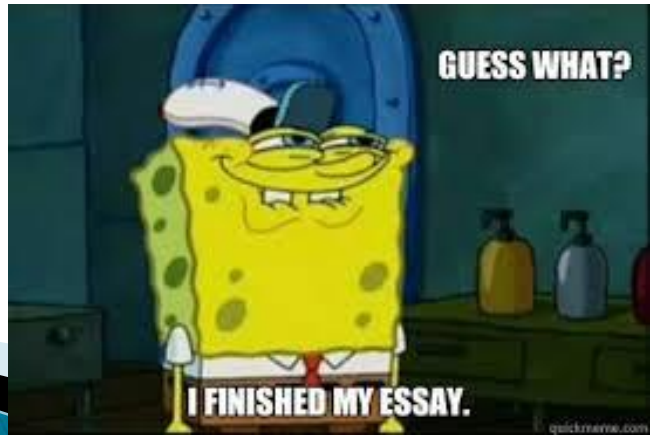
Have a friend/family member read your essay and ask them:

'Can you understand what I have written?'

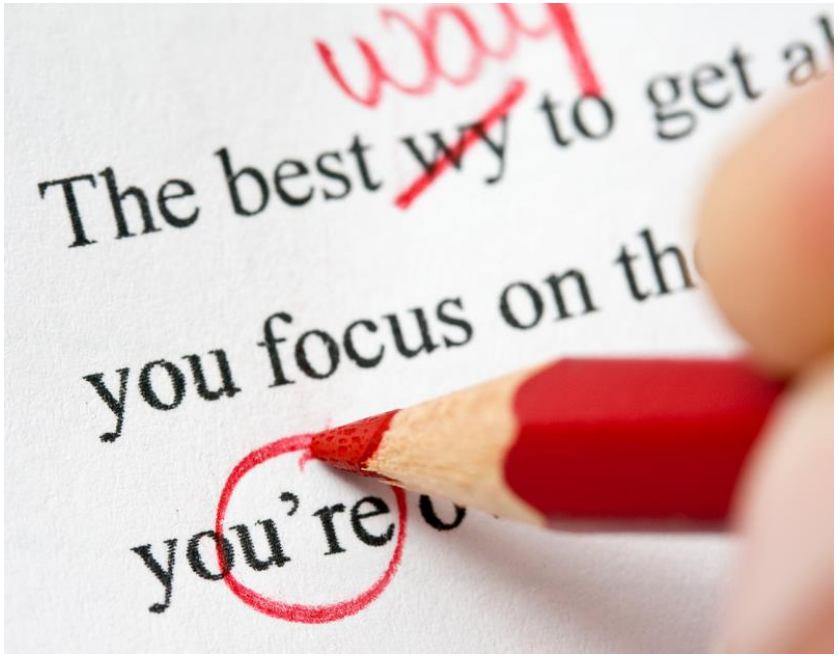
Finalise your essay, then leave it for a couple of days.

Return to your essay with a fresh focus and proofread for consistency, flow, grammar, spelling and structure.

Make the necessary changes, then submit your essay.



Common issues



- Anthropomorphism
- Colloquialisms
- Emotive language
- Contracted words
- Lack of consistency
- Meaning not clear
- Not revising, editing and proof-reading
- Poor sentence and paragraph structure

Zombie Nouns

Nominalisation: Use of the noun form of verbs

Use of verbs: The water is evaporating.
Nominalisation: **Evaporation is occurring.**

Use of verbs: A team of scientists analysed the data…
Nominalisation: **Analysis of data by a team of scientists…**

Use of verbs: The researchers discovered the cause and then developed a cure.
Nominalisation: **The discovery lead to a cure**

Sentence structure

subject – verb – object

An indication of probable asymmetric throat area reduction between the upper and lower throats of this nozzle during reverse thrust operation is shown by the jet-lift coefficients in figure 28.

*The **jet-lift coefficients** presented in figure 28 **indicate** a probable asymmetric throat area reduction between the upper and lower throats of this nozzle during reverse thrust operation.*

Paragraph structure

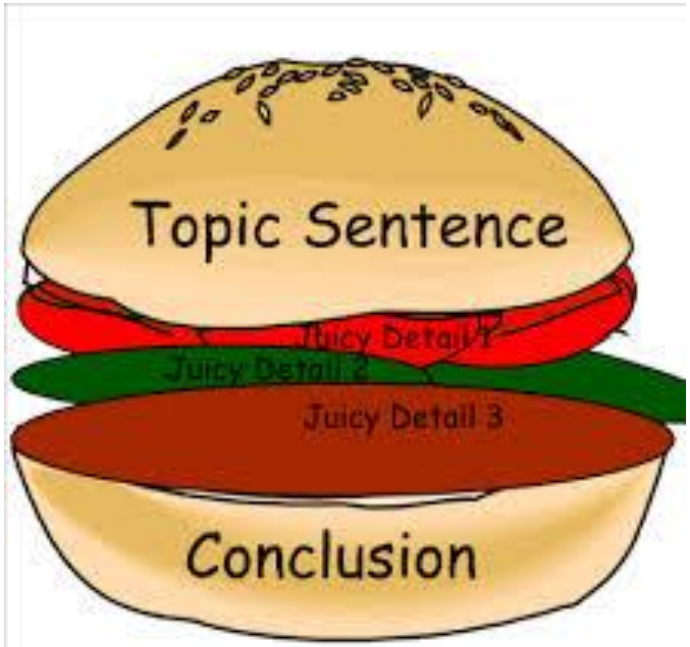
One topic per paragraph

First sentence is the topic sentence and it works like a mini-subheading

Body sentences provide explanation and evidence about the paragraph topic

Final sentence concludes the topic and links to the next paragraph

Juicy



Active/passive voice

Passive: A detailed description of the apparatus used in this research is presented in this report.

Active: This report presents a detailed description of the apparatus used in the research.

Active voice:	**Use passive voice when:**
More direct	The actor is unimportant (It was found that…)
Economy of words	When the receiver of the action should be emphasised (The samples were analysed…)
More concise	

Academic text: mixture of active and passive voice, but **active voice is favoured**

Use of acronyms

Spell out the words and first provide the acronym in parentheses eg. World Health Organisation (WHO) or revolutions per minute (RPM)

Note that only the proper name of World Health Organisation begins with capital letters when writing in full, as opposed to revolutions per minute

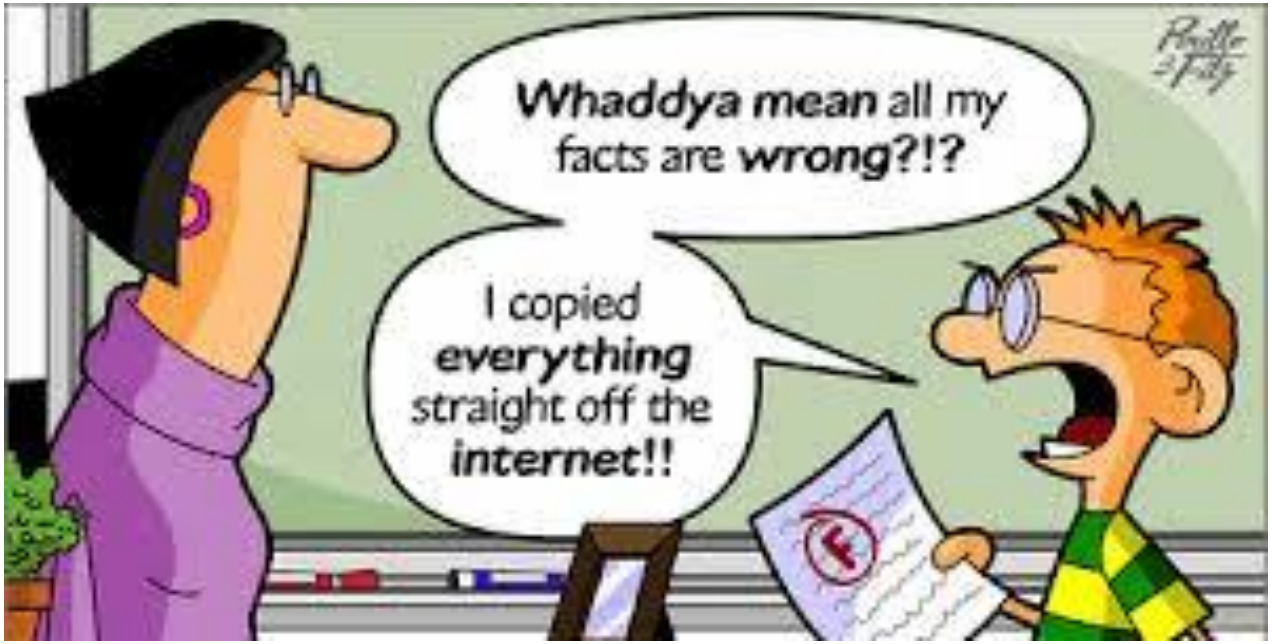
Do not begin a sentence with an acronym, even if previously defined – write in full

Do not use an apostrophe to make an acronym a plural – eg RPMs

Use full forms of words rather than contractions

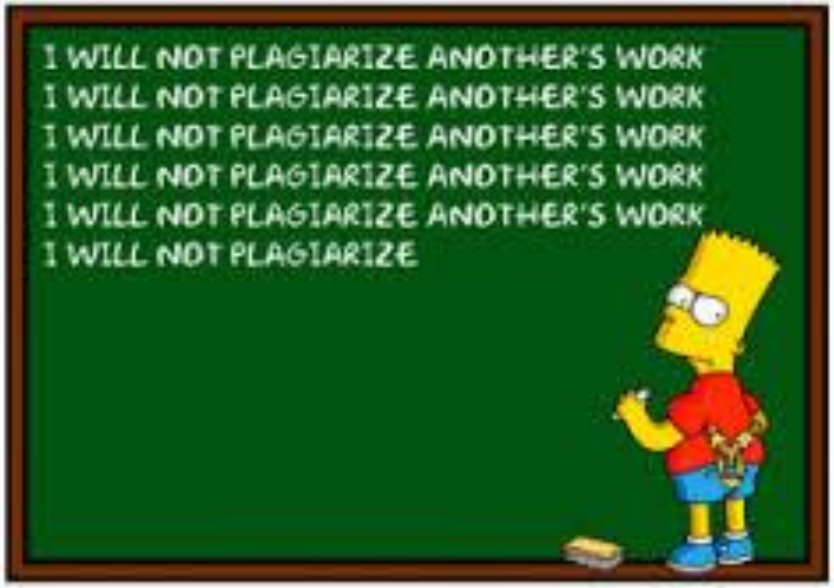
- **is not** rather than isn't
- **cannot** rather than can't
- **did not** rather than didn't

Academic integrity and referencing



Why reference?

- To recognise and respect the original researcher/author
- To show that we have read widely
- To allow the reader to find and verify our sources
- To provide strong support for our arguments
- To avoid plagiarism



Where to reference?

- In the text wherever you refer to someone else's idea
- In a reference list at the end of the document

Ideas, paraphrasing and quotes all require a reference

When is it ok NOT to reference?

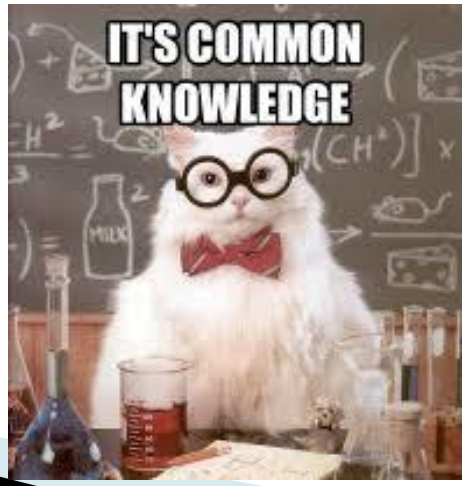
When it is common knowledge.

For example:

Australia is a continent.

The earth revolves around the sun.

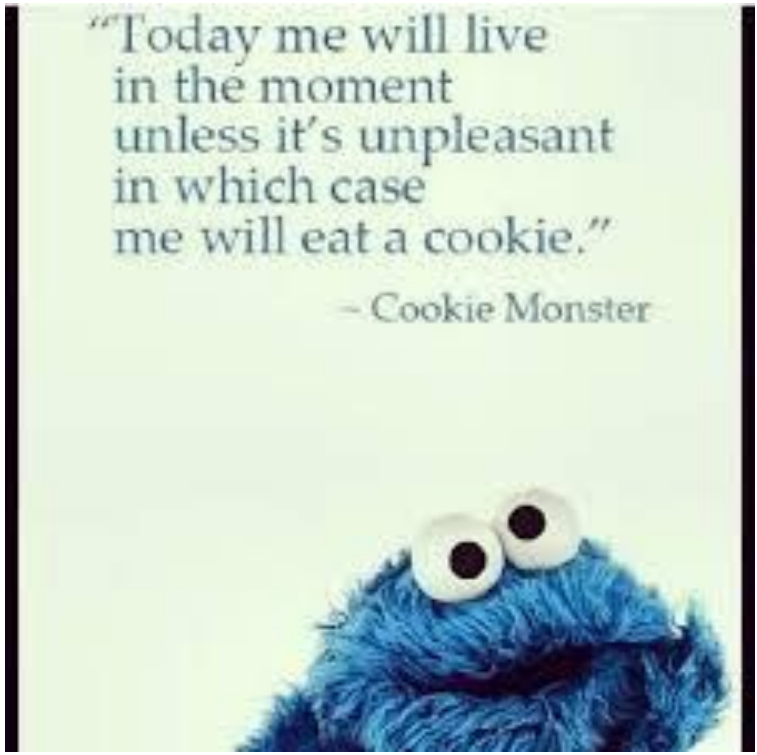
George Washington was the first president of the United States.



Quoting and paraphrasing

Quotes use exactly the same words as the original source and use quotation marks

Paraphrasing uses another author's idea but the idea is expressed completely in your own words



Both quoting and paraphrasing require referencing

In-text references: paraphrasing

Meat pH above 5.8 reduces bacteriological stability of chilled meat (Egan and Shay 1988) and between 5.8 and 6.2 toughness is greatest (Purchas and Aungsupakorn 1993).

Gardner *et al.* (1999) report that merinos respond differently to suboptimal nutrition as compared to other sheep breeds.

The rate of organic sulphur accumulation varies with soil type and climate (Jackman 1964; Saggar *et al.* 1998).

In-text references: quotes

According to Nguyen *et al.* (2005, p. 31) “cultivated chickpea germplasm collections contain a low frequency of blight resistant accessions”.

Laboratory studies have shown that “an average amoeba eats between a thousand and a hundred thousand bacteria a day” (Beattie and Ehrlich 2001, p. 94).

Use dots to show there is something missing from the quote:
According to Vanclay (1992, p. 15), “extension officers report that marginal farmers tend to be less sustainability conscious…as compared to top-end farmers”.

Reference list

Follow the referencing style as per essay instructions, if no specific referencing instructions use Harvard

All in-text references must be included in the reference list

All entries in the reference list must be included in the essay as in-text references

Alphabetical order by first author, surname then initials

List all authors (do not use *et al.*)

Do **not** use dot points or number the reference list

BE CONSISTENT

CONSISTENCY TRUMPS CORRECTNESS

Example reference list

Cargill, M. and Bellotti, M. (2002) *Written communication in the agricultural and natural resource sciences*. The University of Adelaide Learning and Teaching Unit: Adelaide.

Finegold, L. (2002) Writing for science as scholarly communication. *Journal of Science Education and Technology*. vol. 11, iss. 3, pp. 255-260.

Monash University (2015) *Writing in Science.* Accessed on-line (15 June 2015) www.**monash**.edu.au/lls/llonline/**writing**/**science**/index.xml.

Variations:

Authors
Cargill, M and Bellotti M
Cargill, M & Bellotti M

Volume, issue, page numbers
11:3:255-260
11(3) pp. 255-260

Publisher, place
Wiley, New York
Wiley: New York

Internet source
viewed [15th June 2015]
at www…

Journal title
Jnl of Sci Ed & Tech

Year
2002, (2002).

Questions?

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