Access Reading

Study Skills Session, Supporting Documents

Thursday 4th April 2024

Name:

PhD tutor:

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Subject Strand:

Medical related courses

Critical thinking:

Critical thinking can be defined as the process of working out **what** you think and **why** you think this.

Critical thinking is essential to all subject disciplines at university study. It is very common for new university students to receive feedback that they need to think thus write more critically to develop their essays and ultimately receive higher grades.

At university critical thinking also involves:

- Identifying **what you want to know**, and **why**.
- Sourcing **relevant and reliable** information.
- Grounding your thinking in this **evidence**.
- Addressing **contradictions** in wider academic thinking.

Critical thinking is an important study skill that you will develop at university, practising this skill before enrolling at university to help you make a smoother transition academically.

Critical thinking is at the heart of scientific inquiry.
A good scientist never stops asking why things happen or how things happen.
Scientific inquiry involves:

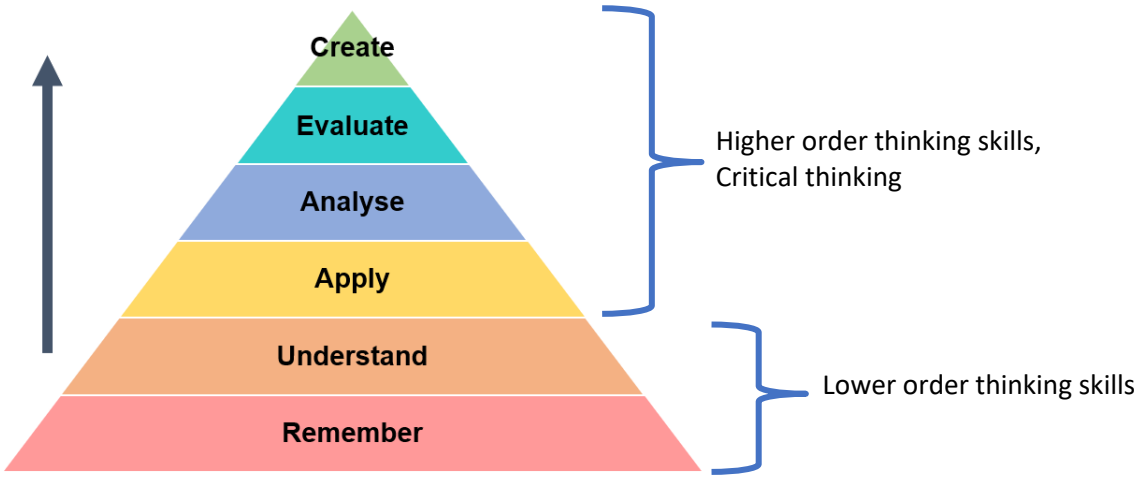
1. **Identifying a problem and asking questions about that problem**
2. **Selecting information to respond to the problem and evaluating it**
3. **Drawing conclusions from the evidence**

Bloom's Taxonomy:

To help establish how critical we are being we can utilise Bloom's Taxonomy. Through Bloom's Taxonomy we can see the stages of learning as a hierarchy of critical analysis.

"Remember" requires the least amount of critical thinking and "Create" requires the most. The higher your university work sits on the pyramid the more critical you are being. This means when you analyse and evaluate academic literature you are seen to be more critical than those which simply describe theories and claims without questioning their validity.

To achieve a higher level on the pyramid you still need to undertake everything beneath it but be sure not to get trapped there!



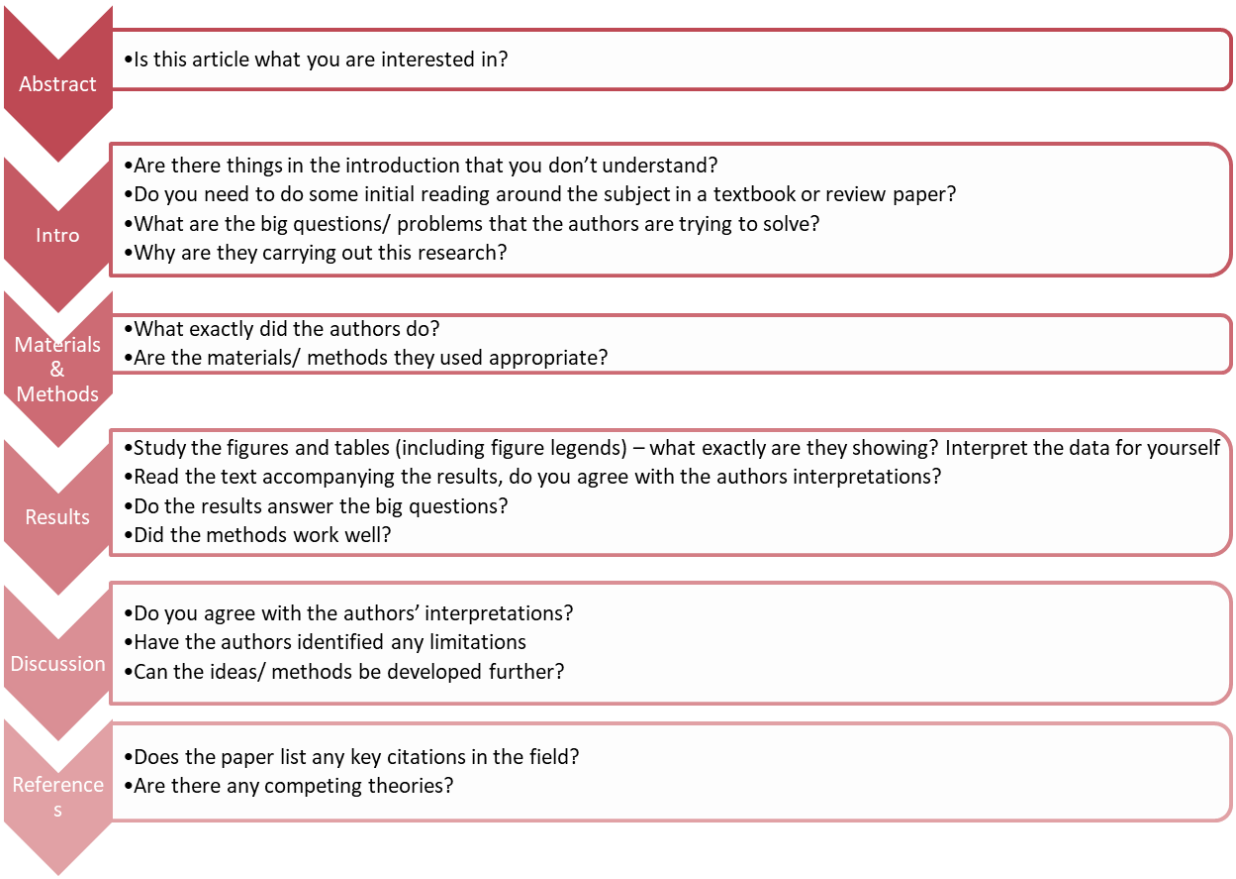
Stages	Description	Examples of words associated with this level
Create	Produce new or original work.	Design, construct, develop, formulate, investigate
Evaluate	Justify a stand or decision.	Argue, defend, support, critique, weigh
Analyse	Draw connections among ideas.	Relate, compare, contrast, examine, question
Apply	Use information in new situations.	Execute, implement, solve, use, demonstrate
Understand	Explain ideas of concepts.	Describe, discuss, classify, recognise, paraphrase
Remember	Recall facts and basic concepts.	Define, state, memorise, repeat, quoting

In pairs, discuss and decide whether the following actions show higher or lower-order thinking and where each of them fits into Bloom's hierarchy of criticality.

Action	Higher or lower-order thinking	Level of criticality
Explain a theory.		
Judge the quality of an interpretation of evidence.		
Test a theory using primary research you have collected.		
Quote a secondary source.		
Find links/ comparisons between experimental data generated by different methods		
Determine whether enough evidence has been collected or presented in a piece of literature.		
Make recommendations.		
Interpret evidence in a way that is informed by a particular theory.		
Paraphrase a source.		
Acknowledge a key finding or theory on the topic		

How to read a scientific paper:

A scientific paper is usually split into sub-sections. When reading a paper, it is often helpful to make notes or annotations. Underline or highlight key words or concepts, look up any words or terms that you don't know and highlight key results that help you to understand the paper.



My thoughts…

Relevant take aways from the extract/information presented…

Things I know already about this topic based on previous experience/learning…

Things I need to know more about…

Critical reading notes:

Remember you don't have to answer all the questions, use them in a way you find useful.

What are the key arguments in the text?	
What were the strengths of the argument presented? What was convincing and why?	
What were the weaknesses of the argument? Are there any flaws, gaps or limitations to the argument?	
How can I use this source to answer the essay question? What can be learnt from this article?	
How does this text relate to other information I have read and/or my personal experience? Does it agree, contradict, or challenge my current knowledge?	
Does the author reference other's work which I would be interested/should look at myself?	

Notes on Extract 1:

Notes from 'Introduction' section:

Critical Analysis:

Being critical does **not** necessarily mean to criticise in a negative manner. To be critical of the text/ methods/ results just means that you **question the information** and arguments given in the text in an attempt to judge its worth overall.

Evaluation is an assessment of the **strengths and weaknesses** of an article or text. It should be measured based on specific criteria, which may be subject or section-specific.

Notes on the 'Methods' section:

Notes on ‘Results’ section:

My thoughts on the paper:

Further resources:

Books:

BIOS Instant Notes Series (Biochemistry, Molecular Biology, Plant Biology etc.) – This is the link to see all available titles in the series, but it is recommended to buy the book second-hand or find a free version online - https://www.routledge.com/Instant-Notes/book-series/IN

Youtube Channels:

Bozeman Science - https://www.youtube.com/user/bozemanbiology

Khan Academy - https://www.youtube.com/@khanacademy

Kurzgesagt In a nutshell - https://www.youtube.com/c/inanutshell/featured

SciShow - https://www.youtube.com/@SciShow

Podcasts:

Nature Podcast - https://www.nature.com/nature/articles?type=nature-podcast

New England Biolabs Podcast - https://www.neb.com/en-gb/podcasts/nebpodcast

The Naked Scientist Podcast - https://www.thenakedscientists.com/science-podcasts

If you have any further questions please email:

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Extract 1: From 'SARS-CoV-2, ACE2 expression, and systemic organ invasion' Ashraf et al., 2021. Physiological Genomics. 53 (2) p51-60

The novel severe acute respiratory syndrome (SARS) coronavirus, SARS-CoV-2, is responsible for the complex disease COVID-19 and is the source of a global pandemic in 2020, impacting nearly every country in the world. SARS-CoV-2 is closely related to SARS-CoV, which was identified as the virus responsible for the SARS outbreak in 2003. Like SARS-CoV, SARS-CoV-2 is a single-strand RNA that is composed of 30-kb nucleotides (1). These nucleotides encode four major structural proteins: the spike protein (S), membrane protein (M), an envelope protein (E), and a nucleocapsid protein (N) (1). Viral infections rely upon cellular entry to utilize the host's machinery to replicate viral copies that are then released by the host (1). Viral entry into the host cells is primarily mediated by S proteins, which make the attachment of the virus to host cellular receptors and facilitate the fusion between host and viral membranes for successful viral entry into the host cell (2). Angiotensin-converting enzyme 2 (ACE2) is a membrane-bound enzyme, which both SARS-CoV and SARS-CoV-2 use as a receptor for host cellular entry (1, 3, 4). However, recent studies have shown that the S protein of SARS-CoV-2 interacts with the human ACE2 with a 10–20-fold higher affinity than SARS-CoV (5–7). This increased affinity to ACE2 may help explain SARS-CoV-2's higher rate of transmission between individuals compared with SARS-CoV.

ACE2 internalization by SARS-CoV-2 is responsible for the reduction of ACE2 levels on the airway epithelial surface (3, 8). Symptomatic patients with SARS-CoV-2 infection are most often reported having fever, cough, nasal congestion, fatigue, and other signs of an upper respiratory tract infection, which can quickly develop into acute respiratory distress syndrome (ARDS) with a low survival rate (4). Although SARS-CoV-2 infection into host lung cells contributes largely to the severe symptoms in patients, it is noted by the Centers for Disease Control and Prevention that individuals with underlying medical conditions such as heart disease, diabetes, obesity, and asthma have a higher rate of infectivity and increased mortality from COVID-19 (9). It is important to note that ACE2 expression is not exclusive to the lungs but is present in most other tissues, including the nasal and oral mucosa, vasculature, kidney, heart, gastrointestinal (GI) tract, pancreas, and brain (10, 11). Furthermore, ACE2 is fundamental to the regulation of the renin-angiotensin-aldosterone system (RAAS), which is a major regulator of blood pressure as well as fluid and electrolyte homeostasis