11

INFORMATION-PROCESSING AND CRITICAL THINKING FOR WRITING

How to approach your analysis of source material

Having collated information and viewpoints in preparation for writing, you need to identify and group ideas and evidence in support. You will need to filter out irrelevant, out-dated or inaccurate material. This information-processing will allow you to produce writing that explains your ideas clearly. This chapter guides you through this process.

KEY TOPICS

- The types of information you may have to process
- Thinking about thinking
- Using method to organise your thoughts
- Recognising fallacy and bias
- Avoiding shallow thinking in your writing

KEY UNIVERSITY TERMS

Concept Conjecture Evidence Fact Fallacy
Hypothesis (pl. hypotheses) Knowledge Objectivity
Paradigm Synonym Subjectivity Taxonomy Theory

This chapter continues with **Step 8** of the 12-step writing process (**Ch 1**) by suggesting strategies of logic and interpretation that will assist you in processing information and opinion as you create your first draft. These strategies will encourage you to engage in critical thinking and so to discriminate between facts, concepts, theories, hypotheses and evidence.

As with many tasks, the key to good writing is in the preparation and, as noted in **Chapters 1** to **7**, the information gathering phase is part of that preparation. The lecture notes, the notes from recommended

and supplementary reading, ideas noted from tutorial discussion and your own thoughts contribute to the mix, as does your willingness to approach university study with an open mind that is receptive to analysing new ideas or challenging older ones. In assembling this information, you will already have engaged in some aspect of critical thinking by making a judgement about what to include and what to exclude.

Definition: critical

People often interpret the words 'critical' and 'criticism' to mean being negative about an issue. For university work, the alternative meaning of 'making a careful judgement after balanced consideration of all aspects of a topic' is one that you should adopt.

THE TYPES OF INFORMATION YOU MAY HAVE TO PROCESS

To understand what it means to think critically, you will need to be aware of the significance of different types of information. Some examples are shown in Table 11.1, namely, concepts, evidence, facts, hypotheses, ideas, knowledge, paradigms and theory. These terms are part of the language of the academic world. Therefore, gaining a full understanding of their meaning as applied to academic discussion is a vital part of your development as an academic writer. Table 11.1 provides a meaning applicable to the use of these terms in the academic community (Chambers Dictionary, 2003), since less formal usage may be less precise. Lecturers often use certain terms interchangeably, therefore, synonyms for each term are given in the third column so that you are aware of words similar in meaning that might be used as an alternative form of expression.

Sometimes students are confused by what someone presents as information when it is simply unsupported opinion or guesswork. Consequently, when evaluating information, you need to recognise the importance of differentiating the nature of information you encounter.

Thus, while some pieces of information represent facts, knowledge relates to a more refined set of structured facts; those that are the nearest to reality. In the academic sense, theory and hypothesis are

Table 11.1 Terms used in academic discussion

Term	Explanation	Synonyms
Concept	Abstract idea, mental impression, general notion, any product of intellectual action, of memory or imagination	• Conception • Notion • Opinion • Thought • Viewpoint
Evidence	Available body of facts or information indicating whether a belief or proposition is true; means of proving an unknown or disputed fact; support for a belief	• Proof • Testimony
Fact	A thing that is indisputably the case, a reality (as distinct from a statement or a belief)	• Actuality • Case • Circumstance • Deed • Reality • Truth
Hypothesis	(Sciences) An explanation of reality that is testable by observation or experiment. (Non-sciences) A proposition assumed for the sake of argument	• Assumption • Conjecture • Premise • Presumption • Supposition
Idea	An image of an external object formed by the mind; a notion, thought or impression, any product of intellectual action, of memory or imagination	• Design • Proposal • Thought
Knowledge	What is known in a particular field; an assured belief	• Cognition • Enlightenment • Information • Science
Paradigm	A particularly well-established theory or set of theories, one that governs understanding and practice across an entire field of study	• Concept • Scientific consensus • Theoretical framework
Theory	A supposition or system of ideas intended to explain something that is based on evidence, but which nevertheless may change if new evidence or understanding comes to light; a set of principles on which a practice or activity is based	• Assumption • Proposition • Thesis

testable notions of reality that are supported by existing knowledge, but that can be refined or rejected as a result of further observation or experiment. Concepts and viewpoints reflect the ideas of individuals groups and arise from intellectual processing. They may reflect opinion that may have little or no foundation in terms of truth, evidence or accuracy. In summary, depending on contexts, these terms can reflect certainty or uncertainty. Recognising these distinctions will help you to reach an understanding of the thinking processes that apply when you process information.

Exercise healthy scepticism

Just because information or views have been published within the covers of a book or an article appears on the internet or has been written by an apparently eminent authority, this does not mean that the content is based on fact or even valid. Be more challenging when reading by looking at flaws in an argument, data that are not accurately presented or viewpoints that are biased. Similarly, be aware of material that may come from unconfirmed sources, such as a blog or personal website. Come to your own conclusions based on your own research, knowledge and understanding of the topic area.

THINKING ABOUT THINKING

Novice writers have to make quite sophisticated selections from different information types, and so knowing how and where these might be used in constructing text will be helpful. A useful model to explain this is a taxonomy or classification created by researchers led by Benjamin Bloom. This identifies six key learning objectives typically involved in processing thought and is outlined in Table 11.2.

Bloom *et al*. (1956) showed that students naturally engaged in thought-processing during their studies. For example, from Table 11.2, you may recognise that your school work mainly focussed on knowledge, comprehension and application. These levels of thinking can lead to heavily descriptive or narrative writing that will earn few marks in higher education, if overdone. By contrast, your university tutors tend to expect more evidence of analysis, synthesis and evaluation, namely, the 'higher order' skills of information- and thought-processing.

These expectations are sometimes closely linked to the instruction words used in assessments and Column 3 of Table 11.2 provides a few examples. Thus when you analyse the instructions used in writing assignments, you should take into account what type of thinking process the examiner has asked you to carry out, and try your best to reach the required level. However, take care when interpreting these instruction words, as processes and tasks may mean different things in different subjects. For example, while 'describe' might imply a 'lower order' activity in the sciences, it might involve 'higher order' skills in subjects like architecture.

Certain disciplines value 'creativity' as a thinking process, for example, Art and Design, Architecture, Drama or English. Creativity involves notions of novelty and originality associated with invention, imagination and/or problem solving. In some cases, this term might take the place of 'synthesis' in Table 11.2, whilst in others, it would even be ranked above 'evaluation'. You may also come across the terms 'originality' or 'original work' in learning objectives and marking scales, indicating an expectation for this type of creativity in your university work.

Consequently, the success with which you apply the instruction words in your writing, as these apply to your discipline, shows markers that you are attuned to the more exacting demands of higher education. This will be reflected in higher grades for your written work.

Contexts for thinking critically

Examples of university work involving high level thinking skills include:

- Essay writing in the arts and social sciences
- Reports on problem-based learning in medicine and nursing
- Case-based scenarios in law
- Reports on project-based practical work in the sciences

Table 11.2 Classification of thinking processes (Bloom *et al.* 1956). The learning objectives shown in Column 1 comprise a classification commonly referred to as 'Bloom's Taxonomy'. Some refinement of the Taxonomy has been conducted by more recent researchers and their preferred use of 'action verbs' rather than nouns to explain the classification is reflected in Column 2 (relevant verbs italicised). The representative examples also shown Column 2 might apply to academic work in an Arts subject such as History or Politics. Column 3 illustrates the types of question/instruction verbs used by tutors when they construct assignment and exam 'questions' and that they use to imply that relevant thought processes are required on the part of the student.

Learning objectives (in perceived ascending order of difficulty)	Requirement for expressing thinking at each level followed by an example of such thinking in academic use.	Representative verbs (e.g. 'instruction words' in tasks)
1. Knowledge	**The ability *to remember* previously learned information.** For example, a student might know that a particular river was an important boundary in terms of international relations, but without being able to identify why.	• Define • Describe • Identify • Order • Outline • State
2. Comprehension	**The ability *to demonstrate* an understanding of the facts.** For example, a student might understand that the river forms a natural barrier which can easily be identified and defended.	• Classify • Discuss • Identify • Paraphrase • Review • Summarise
3. Application	**The ability *to apply* knowledge to actual situations.** For example, a student might use their knowledge and comprehension to explain the terms of a peace treaty that refers to the river as a boundary.	• Demonstrate • Illustrate • Manipulate • Modify • Predict • Solve
4. Analysis	**The ability *to break down* objects or ideas into simpler parts and find evidence to support *generalisation*.** For example, a student might explain the importance of river boundary as being of importance to the territorial gains/losses for the signatories to the peace treaty.	• Appraise • Calculate • Compare • Contrast • Explain • Question

Table 11.2 continued

Learning objectives (in perceived ascending order of difficulty)	Requirement for expressing thinking at each level followed by an example of such thinking in academic use.	Representative verbs (e.g. 'instruction words' in tasks)
5. Synthesis	**The ability *to compile* component ideas into a new whole or propose alternative solutions.** For example, a student might identify the concept of 'rivers as geopolitical boundaries' and its recurrence in later or analogous treaties and explain how this had governed accompanying hostilities and associated negotiations.	• Arrange • Compose • Create • Develop • Reorganize • Summarize
6. Evaluation	**The ability *to make* and *defend* judgements based on internal evidence or external criteria, thus implying creativity.** For example, a student might form a judgement as to whether the use of this boundary was an obstacle to resolving the treaty to satisfy all parties.	• Argue • Assess • Draw a conclusion • Judge • Recommend • Support

USING METHOD TO PROMPT AND ORGANISE YOUR THOUGHTS

In written work, a degree of description will often be required to demonstrate knowledge, comprehension and application (Bloom's Taxonomy – Table 11.2). Such descriptions might be confined to explaining a context by simply presenting facts, but in academic work, this description could also involve outlining concepts, hypotheses or theories to establish a context for the main body of the writing.

Many new students do not realise that, although perhaps acceptable at school, description alone is insufficient for an essay at university level of study. Consequently, they lose marks in their writing because they simply restate facts or statements, that is, without explaining their importance and context, or without showing their understanding of what the material means or implies. Such writing would probably be regarded as superficial narrative that does not demonstrate a student's ability to process complex information.

To move forward, students need to develop ways of processing the information to create writing that meets the university standard. This

relies on critical thinking to reach a logical conclusion and involves steps such as those listed below. You should regard this listing as a menu rather than a recipe – think about the different elements and how they might be useful for the specific issue under consideration and your own style of work. Adopt or reject them, or chop and change the order in which you use them as you see fit.

- **Go back to basic information.** Revisit the learning outcomes for your module or course. Work out how these relate to your topic and the writing required (**Step 1** in the 12-step process of writing).
- **Make sure you fully grasp the nature of the task.** This relates to **Steps 5–8** in the 12-step writing process. Thus, if a specific question has been given as part of the exercise, then analyse its phrasing carefully to make sure you understand all possible meanings (**Table 8.2**). When analysing the instructions used in writing assignments, you should take into account the type of thinking process the examiner has asked you to carry out, and try your best to reach the required level (Table 11.2). If you have been given a general topic, rather than a detailed question or instruction, then write down a brief description of the aspects you wish to address to clarify the terminology and concepts involved.
- **Review and check the information you have collected.** You need to ensure that you fully understand what you have gathered. This could be as simple as using dictionaries and specialist reference sources to find out the precise meaning of key words. Cross-checking explanations in different sources can also help.
- **Organise your approach to the task in three phases.**
  1. **Open thinking**. Consider the issue or question from all possible angles or positions and write down everything that comes to mind. Don't worry at this stage about the relevance or importance of your ideas. You may wish to use a 'spider diagram' or 'mind map' to lay out your thoughts (**Figure A2.5**).
  2. **Analysis.** Now you need to decide about the relevance of the grouped points to the original problem. Typical groupings include:
     - classifications
     - time-sequenced events
     - support and opposition/counterargument for a viewpoint
     - comparison or contrast of issues or perspectives
     - cause and effect relationships

Reject trivial or irrelevant ideas and rank or prioritise those that seem relevant. A new diagram, table or grid may make things clearer.

3 **Synthesis and evaluation.** Think through your argument, and work out how you can support it. Having considered relevant information and positions, you should arrive at a personal approach or viewpoint, and then construct your discussion or conclusion around this. When writing about your conclusion, you must take care to avoid value judgments or other kinds of expression of opinion that are not supported by evidence or sources. This is one reason why frequent citation and referencing are demanded in academic work.

What are value judgements?

A value judgement is a statement based primarily on a subjective viewpoint of opinion rather than an objective analysis of facts. It is therefore influenced by the 'value system' of the writer or the speaker. Value systems involve such matters as ethics, morals, behavioural norms and religious standpoints that are embedded from a person's upbringing and hence influence their views on external matters, sometimes unwittingly. A value judgement may be detected through the use of 'loaded' language (consider, for example, potentially contrasting usage of 'freedom fighter', 'insurgent' and 'guerrilla'. One aim of academic analysis is to minimise subjectivity of this type by evaluating all aspects of an issue and focussing on logical interpretation of facts.

RECOGNISING FALLACY AND BIAS

A logical approach is essential for academic arguments and discussions. As a writer, you must develop the ability to analyse the logic of others' viewpoints and you must ensure that your own text follows a clear logical path. To do this, you need to detach yourself from the argument itself and think about the way in which it is conducted. One of the best ways of developing this skill this is to study the ways in which logic and argument break down through fallacy and bias. There are many different types of logical fallacies. A few common examples are listed in **Appendix 3** to show you the sorts of things that may arise.

Definitions

Bias – information that emphasises just one viewpoint or position

Fallacy – a fault in logic or thinking that means that an argument is incorrect

Propaganda – false or incomplete information that supports a particular political or moral view.

Once tuned in to this way of thinking, you should be able to observe that faulty logic and debating tricks are frequently used in areas such as advertising and politics. Analysing the methods being used can be a useful way of practising your critical skills.

Bias is the use of selected information to support a viewpoint. One way of avoiding bias in your own work is to try to balance your discussion by considering different viewpoints rather than just confining your writing to presenting a single viewpoint. Furthermore, students frequently assume that there are two opposing positions on an issue, when in fact there could be multiple views. You should acknowledge these in your text, even though you might confine your in-depth discussion to the more well-known, dominant or contrasting aspects.

In academic work it is important to recognise that knowledge and understanding may change through time. Hence, avoid 'absolutes' – be especially careful with words that imply that there are no exceptions, for example: 'always', 'never', 'all' and 'every'. These words can only be used if you are sure of facts that imply one hundred per cent certainty. **Table 10.2** provides further information on 'absolutes' and associated 'hedging' language.

Objectivity in your writing

If you want to communicate clearly in writing assignments, then it is important to adopt a style of writing that conveys your ideas in a way that presents an objective perspective on the topic (Ch 10). If you provide your reader with subjectively worded commentary, then they will be less likely to consider your work as a professional piece of writing. It is possible to write in a detached way, yet convey that the views are personal.

AVOIDING SHALLOW THINKING IN YOUR WRITING

Aside from fallacy, bias and plain and simple error, there are many other ways in which students' thinking may be faulty or shallow. Typical examples include:

- generalising
- thinking in terms of stereotypes
- personalising
- over-simplifying
- using arguments based on incorrect assumptions
- using outdated information as evidence
- making value judgements
- making unsupported statements using absolute terms
- rushing to conclusions.

To avoid these sorts of faults in your own writing, engage in critical thinking, so that you:

- base your points on information that is specific
- appraise viewpoints that have been well-debated
- explain complex content clearly and fairly
- reach conclusions based on measured consideration of all aspects of evidence.

PRACTICAL TIPS FOR CRITICAL THINKING AND INFORMATION PROCESSING IN WRITING

Keep an open mind when you approach a new assignment. Although you may start with preconceived ideas about a topic, you should try to be receptive to the ideas of others. You may find that your initial thoughts have become altered by what you are reading and discussing. If there is not enough evidence to support any conclusion, be prepared to suspend judgement.

Draw on the ideas and opinions of your peers and tutors. Discussion with others can be very fruitful, revealing a range of interpretations that you might not have thought about yourself. You may find it useful to 'bounce ideas off' others in your group. Tutors can provide useful insights especially when you are participating in group

activities such as tutorials or labs. This helps you to appreciate wider perspectives than those you first formed on your own.

Look beneath the surface. Decide whether sources are dealing with facts or opinions; examine any assumptions made, including your own; think about the motivation of writers. Rather than restating and describing your sources, focus on what they mean when they write.

GO And now . . .

11.1 Scrutinize the depth of thinking in your own work. Select a past essay or assignment, then reflect on the thinking processes shown in Table 11.1 and identify the extent to which these are evident in your own writing. For example, the early sections may contain descriptive material or cite applications of a concept. Later parts may include deeper analysis and evaluation. If you are appropriately self-critical (itself an important thinking skill), you may recognise that you could perhaps have achieved a better balance between the 'lower order' and the later 'higher order' elements. This might connect with tutors' feedback on your work (Ch 18) and reveal how you could improve your marks.

11.2 Watch how different journalists present information to listeners, viewers and readers. Radio, television and newspaper reporters pass on information sometimes objectively and sometimes subjectively. Follow a single 'story' over a week as reported by different media and evaluate coverage for incidences of biased reporting. This will contribute to your understanding of objectivity and subjectivity that will help you maintain balance when considering what you write yourself.

11.3 Practise examining all sides of an argument. Choose a topic, perhaps one on which you have strong views (for example, a political matter, such as state support for university education; or an ethical one, such as vivisection or abortion). Write down the supporting arguments for different sides of the issue, focussing on your least-favoured option. This exercise will help you see all sides of a debate as a matter of course.

Further detailed information about the issues in this chapter can be found in McMillan and Weyers, 2013b. *How to improve your critical thinking and reflective skills*.