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8. Critical Thinking

Use this study guide to find out about 'critical thinking' and:

- Generate and explore ideas
- Ask questions and plan answers
- Use and critique ideas to develop arguments
- Organise and structure your writing

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Introduction

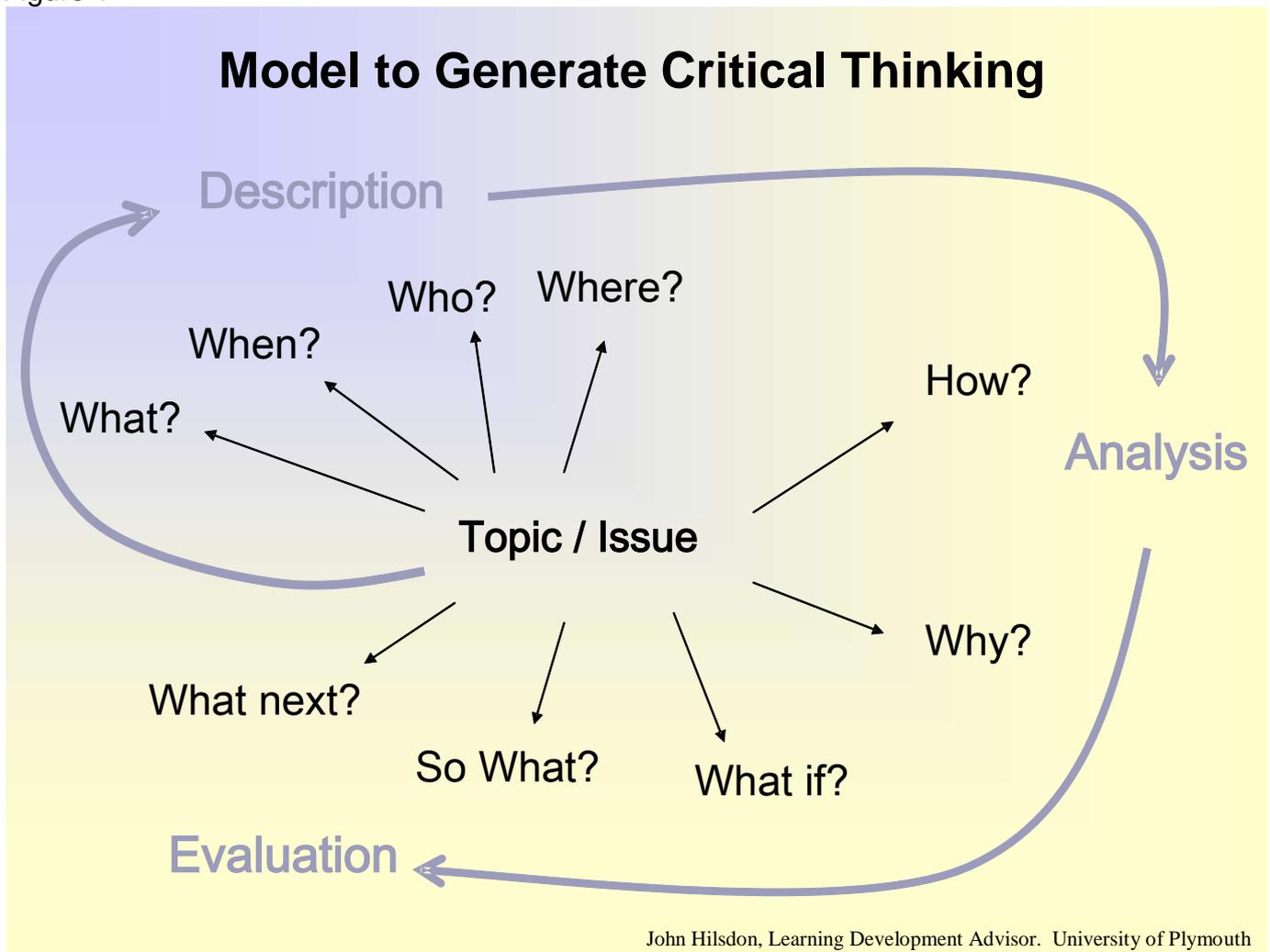
0.1 What is in this guide?

The three main sections of this study guide mirror the three broad stages of writing an assignment such as a university essay:

1. Raw material: **researching**; gathering ideas, information and data; making notes
2. Process: **thinking and writing**; selecting from and processing the 'raw material' by applying critical tools to understand it and to draft your own arguments
3. Product: **editing and improving your writing** to produce successful assignments

This guide is based on the 'Model to Develop Critical Thinking' (Figure 1, below). Section 2 concentrates on asking and answering questions systematically to develop a coherent structure to your assignment - including the key functions of **description**, **analysis** and **evaluation**.

Figure 1



The colour coding here is consistent throughout the guide. **Blue** represents description and **yellow** represents critical-analytical and evaluative thought. (See section 1.2.5 for how to use this model effectively.)

0.2 **What** is critical thinking?

Being 'critical' in the academic world doesn't mean being negative – it means asking questions to find out if information and ideas are accurate, appropriate for the circumstances, or useful. Despite the important emphasis at university on acquiring knowledge, the tasks set for students require more than just a demonstration that material has been memorised. A vital step to learning and to producing successful assignments is showing that you can make use of, and make judgments about knowledge. This is where **thinking critically** comes in.

It is hard to give a brief definition of 'critical thinking' because the phrase can refer to a number of complex processes, and may be used rather differently in some subjects and disciplines. If you go to a text book it may take you through the basics of **logic** – which is about **reasoning**, or how to make statements based on sound principles or 'premises', so that the value of **arguments** based on these statements can be judged (See, for example, Bowell and Kemp, 2005; Thomson, 2002). But critical thinking is not just a set of activities and functions for reasoning; it is also an **attitude**, approach or disposition towards study. In this way, **a critical thinking attitude is a commitment that you make** to looking at issues in depth. When a critical thinking approach is embedded into all of your work, it will lead you to deeper rather than more surface-level learning. There is a wide range of books and materials about this subject – some of which are listed in the references section below - the point of this study guide however, is to give a **practical overview** of critical thinking that can be used by students in any subject and at all levels of study.

For our purposes, critical thinking begins by

- Questioning ...
... whatever it is that you are studying: asking **what, who, where, when, how, why, what if, what next, so what?** ... and so on.

Attempting to answer these questions leads you to fulfil functions – or **do things** - that are vital in scientific, academic and social life, such as:

- **Describing** ...
e.g. defining clearly what it is you are talking about, saying exactly what is involved, where it takes place, or under what circumstances
- **Analysing** ...
e.g. examining and explaining how parts fit into a whole; comparing and contrasting different elements; understanding relationships
- **Reasoning** ...
e.g. demonstrating logical thinking about causes and effects; presenting evidence to provide sound arguments and refuting unsound ones
- **Reflecting** ...
e.g. reconsidering a topic to take account of new information or experience in practice; considering other viewpoints; recognising underlying principles;
- **Criticising or critiquing** ...
e.g. identifying and examining faults and weaknesses in arguments, as well as acknowledging strengths and merits

- **Evaluating ...**

e.g. commenting on degrees of success or failure, or judging the implications, ultimate use or value of something

0.3 ...and **what** is it for?

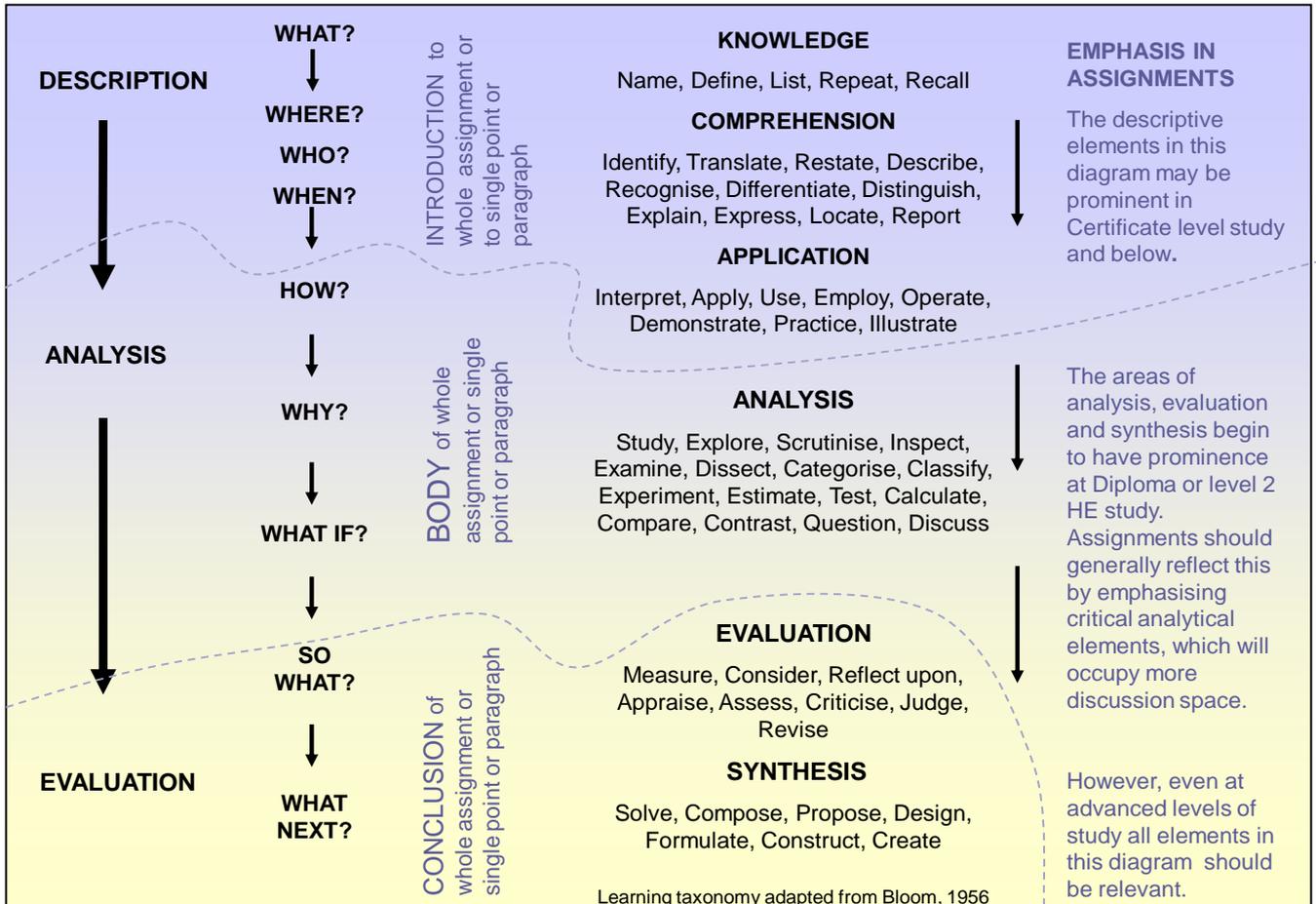
Critical thinking is for life! You could see it as a tool box containing the essential equipment you need to approach the complexities of the world. Those tools are the basic questions in our model. Adopting a critical approach gives you a good foundation for decision-making, planning, taking action - and also for reflecting (see section 2.5) so that you can learn from experience. This may apply as much to thinking about careers and practical aspects of life such as budgeting and accommodation, as it does to being a citizen in the 21st century and part of society at large. It is what we need to do both individually and collectively in order to be conscious of ourselves and our world; to participate actively; to make the most of our potential; and to make sense of what happens to us. Brown and Rutter (2004:9) observe that it helps, '... our integration of knowledge with experience', and enables us to link theory to practice. Critical thinking could be considered a kind of bridge with two way traffic between life experience and learning.

In social life, work, employment and business, critical thinking is what turns inspiration, originality, and creativity into practical projects. Making things work well requires criticality so that you think through each stage of an operation to avoid unnecessary pitfalls and errors. Critical thinking about all aspects of a project will also ensure that attention is given to quality, evaluation and mechanisms to build in further improvements in response to experience.

In university work, critical thinking is what turns raw ideas into considered arguments. Of course, you have to have a base of relevant knowledge to start with – and be open to new material as you go along. Thinking critically will accelerate your rate of learning and your ability to select, assess and use information effectively so that your understanding of your subject grows.

Critical thinking is what is needed to turn 'average' assignments into good or excellent ones! This process of asking and re-asking questions is essential whatever your task at university: whether producing written material, giving a presentation or participating in discussion. The diagram below (figure 2) represents how depth of critical thought corresponds to levels of learning and quality of presentation or writing:

Figure 2: Functions, questions, content and structure – an outline map



1. The Raw Material: Ideas

Ideally, the information, views, questions and theories you encounter in your lectures, seminars, reading and discussions with other students should inspire you! This is more likely if you engage with your subject actively – ask your own questions and think critically.

1.1 What ideas?

An idea can be

- A thought, impression, notion or belief. It can also be the link between a number of related facts, or a plan for a possible course of action.
- Ideas are normally underpinned by patterns or relationships identified in data, facts or observations - or, in some disciplines by personal feelings, beliefs, views, values and assumptions. Some ideas may seem to have less foundation than others, borne out of imagination and having little explicit knowledge surrounding them. This is not to say that such ideas are not valuable – even intuitions can be seeds for an argument. However, each idea must be developed and its underlying principles examined in order to see if it can be used as part of an argument.

- For university assignments, choose material for ideas strictly related to your assignment title – see section 2.1 for help identifying the keywords which will be a starting point for your thinking and research.

1.2 **Whose** ideas? Originality and plagiarism

There is often much confusion surrounding originality, plagiarism and the use of other people's ideas. If you are concerned about these issues, see our 'Guide to Referencing', and the section on plagiarism in Study Guide 6. Bear in mind that the point is not merely to prove you've done your research, but to show your own work – i.e. how you've engaged with or contributed to this particular issue. Although academic work must always be researched, substantiated and evidenced, and other authors must be credited by accurate referencing, it is equally important to contribute your own ideas or interpretations to produce an interesting and original assignment. Completely new ideas are rare - but it is possible to find a new aspect, context, problem or issue within an 'old' topic.

1.3 **Where** do ideas come from, and when can they occur?

The starting point for an assignment is to generate ideas to explore your topic. Reading and talking about it will give you more information – but asking questions is the best way to begin, and to keep you going! Below are some suggestions for generating ideas to do with your topic. Be open to those which might arise from 'non-study' contexts, perhaps from the news, conversations with friends or family, your leisure reading or from discussions and debates. Some people say that their best ideas just seem to 'pop up' when they are doing something unrelated to study - like having a walk; doing the washing up; dreaming or exercising. But although they seem effortless at the time, these inspirations will usually only arrive after a period of incubation following some serious thinking done previously.

1.3.1 'Brainstorming'

'Brainstorming', or 'word storming', is about letting ideas come to the surface of your mind and then writing them down without deliberate thought. It is a very good way to begin any thinking process – be it creative or critical, or both. Your ideas can be recorded in note form, or with doodles, and then used as a basis for the planning and research stages that follow (Creme and Lea, 2003:19). You could do this on a computer but many people find using pen and paper more immediate and flexible for such a 'creative' exercise. Here is one suggested approach:

- Using a blank piece of paper (larger than A4 if possible) and perhaps different coloured pens or pencils, write the question, topic, or keyword(s) in the centre of the page.
- Then carry out a 'stream of consciousness' word-association activity: in other words - brainstorm! Scribble down everything you can think of that's related to your topic, preferably using just keywords.
- If you only have A4 paper and can't fit it all on the page, try taping several together to make a larger sheet (it's really helpful to have everything on one piece).
- At this first stage do not allow your rational 'editor' self to dismiss or alter anything you write – this can be done later, and you may wish to refine it into a 'mind map' (see section 3).

- Sometimes you may find that particular new ideas which emerge need their own brainstorm on a fresh piece of paper! In this way you can end up with a series of brainstorms that reflect how your ideas have evolved

1.3.2 Discussion

Strengths: the value of discussing a topic or idea is often underestimated. Talking with other students, friends on different courses or other people whose experiences are different from yours is excellent for idea-gathering - and for making friends. Ideas don't just multiply according to the number of people you talk with – your own ideas multiply as well – at the same time your previous ideas develop and become refined. One of the most constructive things about a discussion is having to say your own ideas out loud; this helps you clarify what you think. It makes it a stimulating and useful exercise for all involved and reminds you that it's not uncool to be interested in your subject!

During these discussions

- Make lists and write notes for each other
- Sketch rough diagrams or charts as you go to both record and aid the process
- Ask each other questions such as 'why do you think that?' or 'what if ...'
- **Challenge** (sensitively) what others say (and sometimes even if you agree)
- Remember that it is a brilliant opportunity to fill in gaps in your knowledge or spot flaws in the logic of your own or others' material.

Weaknesses: your friends might be cautious about sharing their ideas. Of course, taking other people's ideas as your own is unethical but collaborative work is often very productive – and your interpretation can enable you to evolve an idea of your own. So, be generous in your discussions!

Discussion takes time, patience and willingness to listen, but this apparent disadvantage can also become an advantage. Careful listening, followed by questions to check if you have understood, is one of the most valuable ways to learn. However, if you plan to make use of discussion, you will certainly need to give it plenty of time.

1.3.3 Reading

It is worth thinking about why you read and what you want or need from the activity (see Study Guide 4, 'Reading Skills'). It is important to think of it as not just absorption of information but also as stimulus to test out and develop your own ideas. Although academic work needs to be based on scholarly literature, sometimes even informal writing - a news item, for example, might spark an idea or raise a question in your head on your topic or perhaps on another topic that you hadn't thought of as related.

Read as much as you can, but actively, not passively. This basically means **questioning** as you read (remember – this is what critical thinking is all about) rather than trying to absorb information like a sponge (which just results in 'superficial' learning). It is no use reading 10 books without really thinking about the issues as you go along – better to read 3 and enter into the debate with them! In any case, reading without actively thinking means you will certainly forget most of the material – whereas reading with questions in mind is much more likely to be remembered. Look at the ideas of others **making sure to think critically as you read**. To do this most effectively, have a look at the 'SQ3R' method: Surveying, Questioning, Reading,

Recalling and Reviewing (see Study Guide 4, 'Reading'.) or the 'cooker' (QOOQRRR) approach (Burns and Sinfield 2004: 81)

As you read try to consider the material in terms of its

- meanings
- implications
- reasons
- examples
- truth
- validity
- plausibility
- credibility

(Categories adapted from Colorado State University Writing Center, 2004)

1.3.4 Writing

Writing not only fulfils the obvious function of communicating but also has a number of other uses, including helping the thinking process, exploring ideas and generating new ones. Some more functions are identified by Moon (1999:31) and Brown and Rutter (2004:15):

Advantages of writing

- Self-discipline! Writing makes sure you really do spend time on your work!
- Often generates new ideas, connections, questions etc.
- Helps you focus and sift material by slowing you down as you choose your words and beginning the editing process early on
- Helps you avoid getting sidetracked when writing up the assignment, as you will have pursued those issues already and can reject less relevant material
- Forces you to organise and clarify your thoughts so you can sequence them, giving you a structure or framework
- Gives control – you choose which points to make
- Enables identification and prioritisation of material
- Can help you develop a deeper understanding of something as you work through and attempt to explain it
- Helps prevent you forgetting an idea
- Can record a train of thought and relate it to the past, present or future

Weaknesses

- It can be hard to reject or alter something if you feel it's well written, but you must check that it is relevant if it is to be included in the final draft
- Although it is hard to 'throw away' work you have sweated over, don't forget that the process of writing will have helped you to learn and internalise the material – the time will not have been wasted!

Activity: 'FREEWRITING'

Many writers find that 'exploratory writing' is a very good way to **generate ideas**. It can also be useful for **solving a problem**. The theory is that, just as simply talking through a problem can help you understand it without anybody else necessarily explaining anything, so the very act of writing can unravel the complexities of an issue:

- Determine a 'trigger' word or phrase (collectively if working with colleagues, or 'brainstorm' your own)
- Set a time limit (e.g. 5 minutes)
- Write without stopping
- Write what comes to mind without censoring, judging or thinking about it
- If your mind goes blank, write the trigger phrase - and again, until new ideas arrive!
- NO STOPPING! DON'T go back and read your work until the time is up
- NO EDITING, 'CORRECTING' OR CHANGING during the writing time

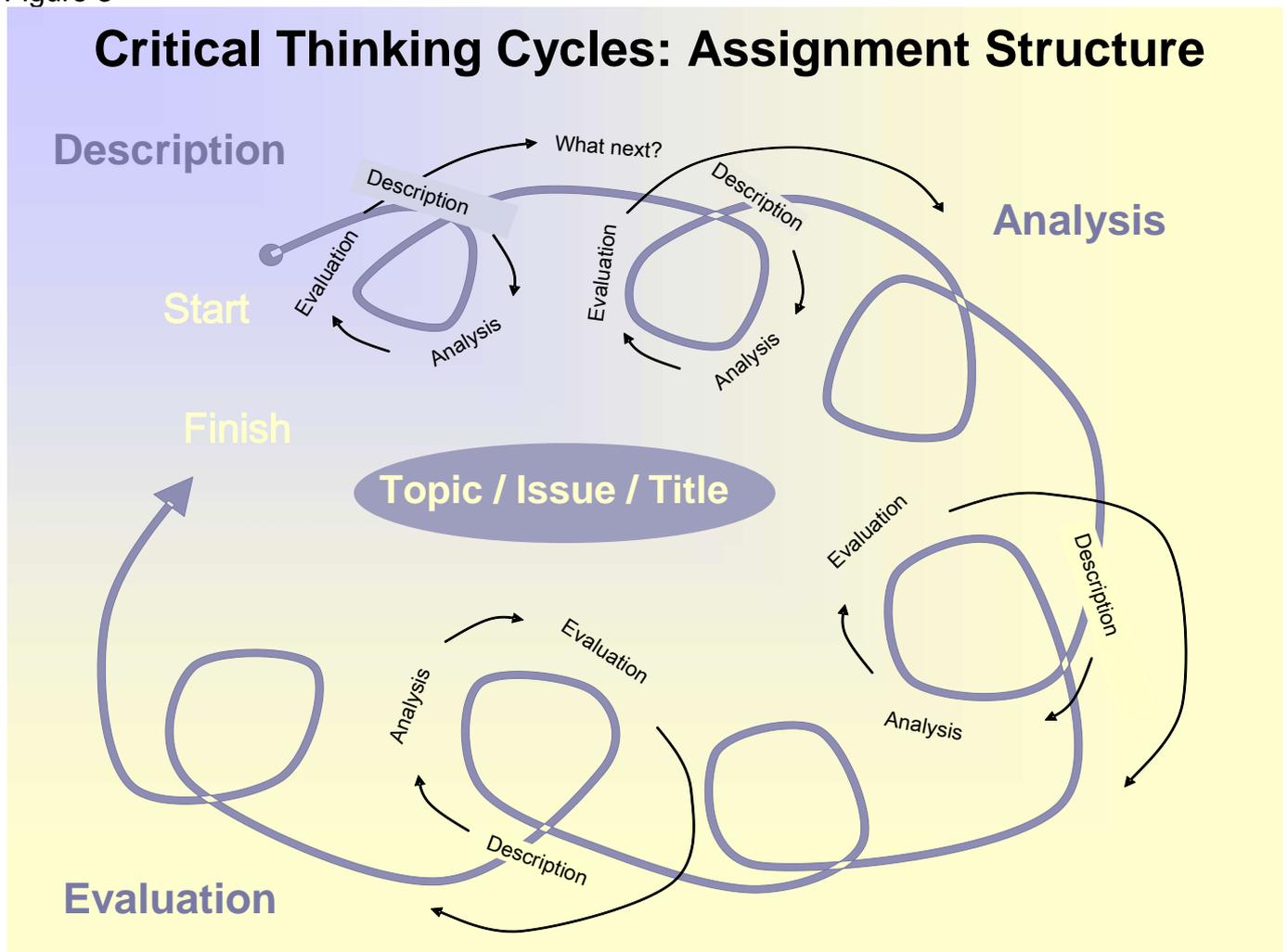
(Adapted from Elbow, 1998)

1.3.5 Models to Generate Critical Thinking

We often use the model shown above in figure 1 in our Learning Development tutorials and workshops to assist students in thinking systematically about their topic. It is a graphic representation of the critical thinking process (illustrated in a highly simplified two-dimensional form). It can also represent the overall structure of any completed piece of writing. It shows the parts of the 'story' (the beginning, middle and ending) in terms of what each part does, or the function it fulfils. In other words, **description** acts to introduce things; **analysis** explains the main part(s) of the story; and **evaluation** presents the conclusion(s).

This model can be used to show a possible structure of a whole assignment or for just one mini-cycle within it; for example, a section, paragraph, elaborated point. Another way to think of this is like a thread of an argument within a larger tapestry which is woven to show a bigger picture – or several arguments. This is because, just as the whole assignment needs the basic structure of introduction, main body and conclusion, so does each substantial paragraph or section. A more realistic model for an assignment could therefore look a bit like the following diagram:

Figure 3



Strengths of the model

It can help you to

- Identify what you already know and generate ideas for further research; organise and record ideas and material using the central key as subheadings
- Plot factual information in response to the largely **descriptive** 'what/when/who/where' questions. This introductory and background information will be relevant to contextualise the issue
- Prompt you to explain and discuss key points in response to the largely **analytical** 'why/how' questions. 'Why' will tend to lead you to use theory - e.g. for explaining logical relations such as cause and effect. 'How' tends to call for explanation of practice such as methods and processes
- Come to conclusions, reach judgements or give recommendations in response to the largely **evaluative** 'what if/so what/what next' questions.

In short, asking and answering these questions in the context of your topic should generate the critical thinking necessary to help you write a relevant and well-structured assignment.

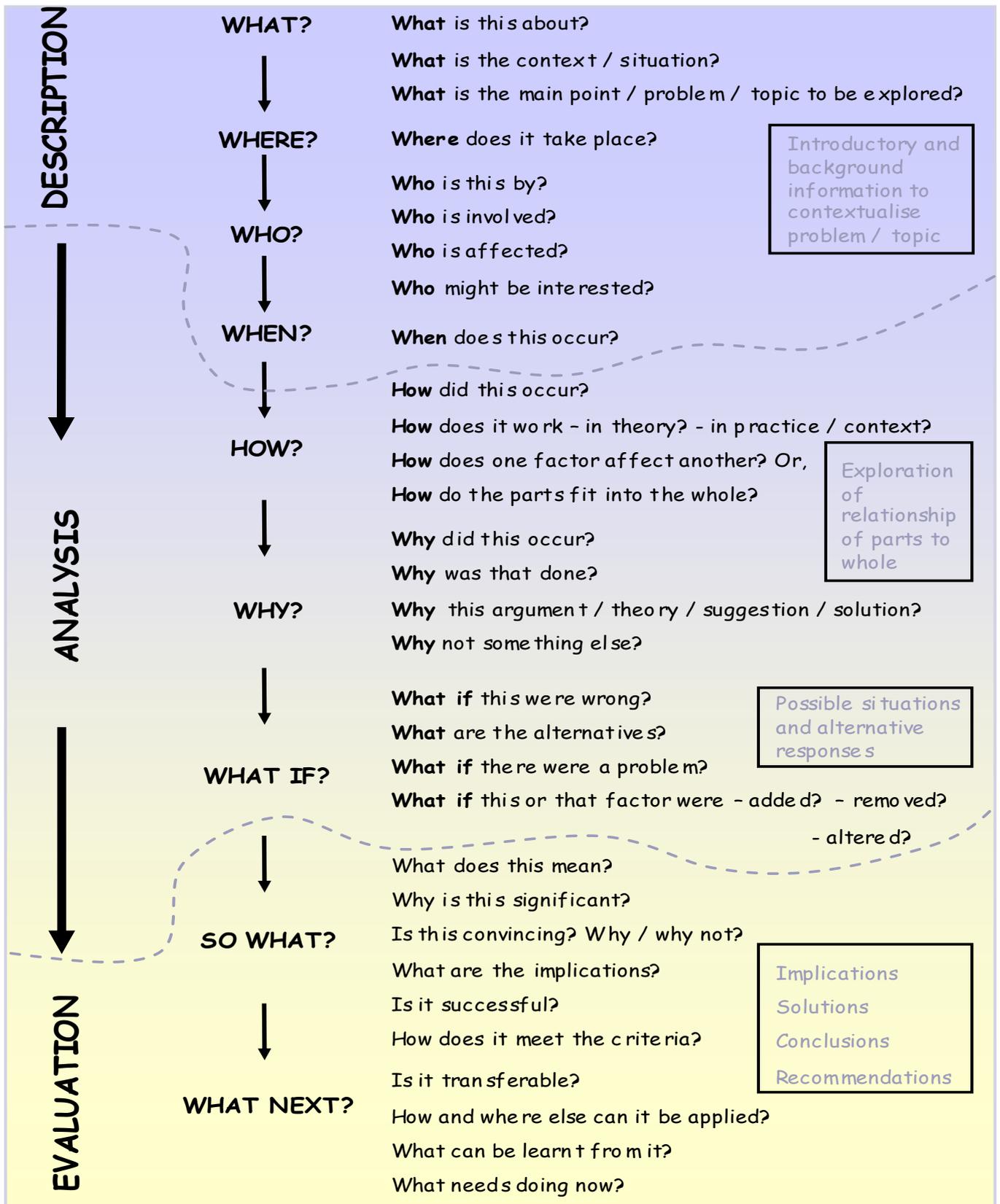
Weaknesses:

- These diagrams can only be simplified representation of critical thinking – in reality it is a much more multi-dimensional and complex process!

Using the Model in Figure 1 to Generate Critical Thinking

1. Identify the topic (this can be your essay title, a subtopic, or a point you might want to explore in a particular section or paragraph) and write keywords in the middle of a sheet of paper, or a blank document screen, where it says 'Topic or Issue' in the diagram above. You could equally do it in a linear way and put these keywords in the place of a title, with the questions that follow spaced out in the margin or as temporary subheadings.
2. Try to answer the questions on the diagram starting with '**What?**' questions. Your answers may become part of an introduction, identifying issues and defining your terms.
3. Under '**Who?**', '**When?**' and '**Where?**', give some descriptive background information – this will provide contextual, or scene-setting, material – also useful for an introductory section.
4. '**How?**' requires consideration of the ways that something operates or works. Now we are moving the function of our work from being **descriptive** to being **analytical**.
5. '**Why?**' takes you deeper into **analytical** territory. It gets you to find reasons and logical explanations or causes. Think about all the possible questions to do with 'why' (see the Critical Questions model below for some suggestions). Your considered answers to such questions are likely to emerge over time from your reading, study and use of specific theories and findings reported in scholarly texts, such as academic journals; published books and research reports; or from other authoritative sources such as policy documents.
6. Asking '**What if?**' moves you into a more **evaluative** phase of your thinking. It helps you to consider and test out mentally, and in your writing, the possible implications or results of a particular action. This question is also useful for considering predictive work done by others, or engaging in forecasting of your own.
7. '**So what?**' is really the key question for **evaluation**. It gets you thinking about value or values. It is also about discriminating between the most and the less important factors in any situation. It also helps you to think through and justify your own position, and discuss its implications.
8. '**What next?**' might refer to recommendations and predictions that your argument has brought to light. It leads to more specific actions and planning for action that might be necessary in certain kinds of assignment such as a project or business report.

Figure 4: Critical Questions Model



This model gives some prompt questions that you might adapt to fit your topic. A simple example of the critical questions in practice is given in figure 12 below.

2. The Process: From Ideas to Arguments

2.1 What is the issue?

In order to produce high quality work it is very important at the beginning of an assignment to

1. **Understand** what the assignment is supposed to be about
2. **Show** that **you** understand what the assignment is supposed to be about, and **ensure the reader** understands what the assignment is supposed to be about
3. Establish what you mean by any **key terms** to be used

The following sections should help you do this successfully

2.1.1 Question analysis

To fully understand the brief, specification or question set, break it down into keywords of the following types, thinking carefully what each means in this context.

- **Topic words or phrases**

Look for the **nouns** or **noun phrases** first (names of things, including concepts or objects). These tell you **what** it is about.

Look for any crucial '**joining**' **words** that link any of the topics – do they open the question up? Do they narrow the question down? Do they make assumptions and if so, do you agree with these assumptions or premises?

- **Actions: instruction words or phrases**

Look for the **verbs** (words or phrases implying action) and then look for their meaning in terms of instructions for you. E.g. 'assess' means judge, measure, evaluate

- **Parameters**

Look for: Date / time / location limits (e.g. 'during the last ten years') and make sure you know the assessment criteria, the deadline due in and the word limit.

We call this the **TAP** model – using the image of a tap as a reminder: once the tap is on, the water can flow!

Figures 5 and 6: Two examples of question analysis of real assignment titles

Question analysis - 3 things to think about

- Topics / content
- Actions
- Parameters

identify
 explain
 discuss
 analyse
 conclude

Are food consumers rational?

UK? EU? Developed world?
 Current? Past?
 Word count, deadline

What does 'rational' mean in this context? Price / cost, need, value, availability, packaging, advertising, placement

Question analysis - 3 things to think about

- Topics / content
- Actions
- Parameters

Identify
 Explain
 Support

Weigh up
 Argue
 etc.

Discuss the long and short term impacts of the Foot and Mouth crisis in 2002 on the tourist industry in the UK.

Word count, deadline

Don't forget the little words! They remind you that you're discussing the impact of 'a' on 'b' and not the other way around

2.1.2 Stating the problem or outlining the territory

In the introduction it is often helpful to ‘unpack’ the specification or set question you have been given. You need to explain how you have interpreted the task and identify the key problem or issue(s) to be addressed, perhaps breaking them down. This may include some discussion of problems that arise within the wording of the title.

Example: The question set asks you to ‘Consider the changing role of the media over the last century’. You might identify and then discuss the different functions of the media: media as communication; media as propaganda; media as education. It might be interesting to evaluate the different roles, measure which has been more prominent and when and so on. However, your research might lead you to find that you actually disagree with the assumption in the question that the role of the media *has* changed – evidence may suggest to you that it hasn’t. Exploring, justifying and illustrating a thesis such as this within your answer would show good use of critical thought.

2.1.3 Defining your terms and using the ‘right’ language

It is very important in academic writing to choose the most suitable and appropriate words. This is primarily to avoid ambiguity and confusion. Many ‘everyday’ words are loaded or have associations that may not be helpful. As we pointed out above, in academic terms the word ‘critical’ does not have the negative load that it carries in daily life. In the former it refers to a generally analytical approach, whereas in the latter it suggests fault-finding. Subjects or disciplines often generate their own specialised language for talking about their area of specialism and their practice; we call this ‘discourse’. It is not just about ‘jargon’; using specialised ways of speaking or writing indicates to a listener or reader your own position in relation to a particular community. For example, are you in the community - or outside of it? As a student you are often somewhere in the process of ‘joining’ a discourse community. Part of that process is communicating to teachers and those marking your work that you understand and have thought about the language of the subject and the concepts it represents.

To guide a reader through your assignment they should be given a clear idea at the onset of what it is you are discussing. This might mean clarifying some key issues, so it is worth reiterating here what two of the key terms in this guide, ‘questioning’ and ‘analysing’, mean:

Questioning means

- Scrutinising
- Subjecting material or theory to examination
- Raising doubts or objections
- Seeking answers from the study of something

Analysis involves

- Examining in detail: going beyond surface-level description and into explanation
- ‘Untangling the threads’ and explaining how parts make up the whole
- Applying, testing and comparing explanatory theories

2.2 **Who, When and Where:** giving a context

As can be seen in the Critical Questions Model, it is important when introducing a topic or problem to contextualise it. This entails giving background information (though some aspects of these details may be significant enough to pursue and discuss later). You might think about

- **Who** the issue affects – **who** is involved and what are their roles? **Who** is **not** involved?
- **Who** may have researched it already; **who** else might be interested?
- **Who** authored the text(s)? What is his/her stake in this?
- **When** did the issue or problem arise chronologically – in the past, present or future?
- **When** do aspects of the phenomenon occur? What comes first, next, after that, and finally?
- **When** and **where** is this relevant? geographically/ physically; under what circumstances?
- **When** and **where** is it **not** an issue?

2.3 **How and Why?**

The next step is to think about how and why something happens or works. Why do that? In order to achieve a fuller understanding. How to do that? By thinking critically, asking and trying to answer questions in order to **analyse** your topic. Asking 'why' might first prompt some kind of justification as to the relevance of the issue and its need to be discussed. How and why questions also help us to investigate and explain pairs of processes such as theory and practice; explanation and method; policy and implementation. They allow us analyse by using logic in such forms as

- Showing the relationship of parts to the whole; making comparisons and contrasts
- Determining relationships of cause and effect; orders of importance and levels of influence or significance of various factors

You might think about asking the following

- How does this occur (what happens?)
- How does this work or operate – in theory? – in practice? – in context?
- How does one factor affect or influence another? In what way(s)?
- How do we know (what is the evidence)?
- Why did / does this occur?
- Why was this or that done?
- Why is this or that suggestion made? or
- Why is this or that argument put forward? or
- Why is this solution proposed?
- Why are the alternatives rejected?

These kinds of question lead on to a further important point about analysing a text ...

2.3.1 Know your sources

Google and Wikipedia are great tools for finding information quickly, but it is ever more important to think about the **quality, reliability and authority** of the sources you use. Bear in mind that a lot of material you encounter online and elsewhere is just not useful for academic work. Much of it is inaccurate, uncritical, too personal or subjective, and a lot of it will be out of

date. Some material is written by misinformed or only partially informed authors, and some will even be deliberately misleading if the author wishes to prove a particular point or has particular interests to serve. All of this is especially likely when it comes to 'popular' as opposed to academic sources. The main criterion for published academic material is that it has been through a process called 'peer-review'. This means that people with recognised qualifications, experience and expertise in their subject have been consulted to read and comment upon the material before it has been accepted for publication. The most common kind of peer-reviewed publication is an academic journal. These sources are generally reckoned to be reliable and of high quality.

At the other end of the scale are websites, chatrooms or magazines where the content may be compared to informal conversation and gossip, and where there has been no formal review process. This is not to say that all such material is wrong or useless – it just means you have to find a way to check it as carefully as possible. The point is to know where your material comes from, and to use a range of sources to verify information - whether you're looking at simple facts or complex theories. Even when you know the sources 'should' be respectable and well-intentioned, it can still be beneficial to read with a 'healthy scepticism', although it is equally true to say that nothing should be dismissed until it is properly understood.

In practice this means **not accepting unquestioningly**, but checking for

- Information presented as 'given' – can facts be checked? Is sufficient evidence or explanation given? Is the material up to date?
- Verification – do other reliable sources agree, support or refute the point in question?
- Quality of logic – does it make sense? Does the argument follow – e.g. does a particular premise really lead to the conclusion offered?

2.4 What if...?

Having analysed the relationship of parts to the whole you are in a position to consider how they might respond to the presence or influence of other factors. In practice this might mean looking at what might happen if a certain problem arises, or what happens if certain factors are added, altered or removed...

- Does the argument remain sound or is it undermined?

This is a good way to verify or test an argument. Another way is to make comparisons with other theories and ask

- How do competing theories fare?
- Does one account better for problems than the other(s)?
- Are any of the arguments or theories more or less adaptable to variable factors?

Asking and attempting to answer questions such as these will require some consideration of strengths and weaknesses, or merits and defects, of arguments and counter arguments.

2.4.1 Testing and verifying

Your own theories and those of 'experts' should be tested for plausibility and verified. To what extent can they claim to be accurate? Whilst undergraduate students are not often involved in conducting primary research, reading enough critical material should be sufficient to make informed judgments on the soundness of arguments and theories. This entails not only some

serious consideration of the context, evidence and details, but might also involve putting a theory into practice (at least mentally) in a different but comparable context.

Example: if it is true that a plant growing in the Amazon rainforest will be a darker colour if it needs less light, will it also be true for a houseplant in a darker room? A scientific experiment to look at this may not be as simple as it sounds, and generally you would need to consider a host of other factors ... from which plant families and 'kingdoms' are the subjects? What role does climate play – or the different aspects of it, such as air pressure, precipitation – or the presence of other plants or insects in the environment? Are you comparing like with like ...?

So an idea needs to be tested before being presented, and given that someone else's logic may be faulty, their idea should be tried before you accept it. A critical thinker would therefore spend time assessing all aspects of the arguments before accepting an interpretation or solution.

2.4.2 Comparing and contrasting

When in your study of others' work you find common topics, problems, methods, approaches, hypotheses and arguments, it is useful to look at **similarities and differences**. This can help you evaluate others' ideas and refine your own, so that you produce more informed and valid responses to the question or brief set. You should consider where the differences and similarities lie, why they occur, and whether they are qualitative (i.e. show that one study is better or worse, or more or less reliable or convincing).

These **differences** and **similarities** might consist of, or be found in:

- Situational / contextual factors (time/knowledge/resources/place/culture etc)
- Problems
- Approaches
- Reasoning
- Principles
- Assumptions
- Methods
- Results
- Predictions
- Solutions

Method and results might be of more interest in some subject areas, such as engineering, whilst underpinning principles might have more significance in others; in social care, for example. Differences may be found in approach and method, whilst similarities are evident in results or conclusions – or vice versa.

Example: in a science laboratory two different tests or types of test may show the same thing, say: that darker coloured plants require less light than lighter coloured ones. On the other hand, one expert may suggest that a certain series of events might lead to a catastrophic outcome, whilst another may predict a favourable outcome resulting from the same occurrences. You might find on closer examination of both cases that one of the conclusions was doubtful because certain factors were overlooked, or certain steps in the experiment were omitted. Then it would be insightful (and would show critical thinking) to ask why one approach was more or less reliable than the other. This is what you need to do when you are asked to compare and 'critically review' or 'critically evaluate' research studies or a set of findings from trials or experiments.

2.5 So what?

Asking 'so what?' of an argument or proposed solution (or theory, or result and so on) means **critical evaluation** – i.e. getting to the point of it! It involves reflecting on meaning, looking at things such as overall significance and implications. This **evaluative** work shows the depth of your understanding, and is increasingly required as you progress in university study from stage one to degree and then to honours and postgraduate levels.

The need to evaluate applies at both the micro and macro levels, so one simple sentence should be subjected to the same reflection as a whole thesis. Very often, pieces of information are included in students' work without being properly integrated into an argument, so that a reader is left thinking, "What was the point of that?" (i.e. 'so what?'). As a writer, you should pre-empt this by showing clearly why you've chosen to include what you have, and ensure that arguments lead to a clear destination, rather than leaving the reader to wonder what the point was.

Undertaking evaluation also helps to show the validity of an argument. You might complete your work by considering the relevance, usefulness, and transferability (and any other specific factor appropriate for your subject), and evaluating its worth according to clearly **established criteria**. This too will pre-empt the 'So what?' question.

Example: if your specification asks you to design a house, it may also include explicit criteria such as that the house should be of the same style as surrounding buildings and also efficient in terms of energy consumption. It might not state that the house should also be built to last, but this would probably be a factor to take into account when choosing materials. Therefore it would be very relevant to establish this as one criterion early on and then evaluate accordingly.

2.5.1 Reflection

Reflecting could be paraphrased as taking 'time out' to think over your practice and experience to date. It involves 'standing back' to achieve some perspective, reassessing and perhaps altering your preconceptions, beliefs, assumptions or even your values (Brown and Rutter 2004:19, 23). It enables you to

- Develop greater awareness of individual elements and their impact on a whole situation
- Recognise underlying themes and principles
- Understand different interpretations and consider other viewpoints
- Identify and correct errors and mistakes; plan for more effective practice in future
- Reconsider your own overall values, theories and viewpoints

All this greatly aids the learning process, and the more you learn, the better you can reflect, and so on.

2.5.2 Evaluation

A judgement might appear in what can be thought of as the **conclusion** of a piece of work. Although 'sitting on the fence' is not to be encouraged in itself, it should be noted that a strong bias is not necessarily desirable either. A 'verdict' might be qualified by several 'ifs', so that variables are taken into account and a 'black and white' view is avoided, thus affording an

argument more credibility (see section below on synthesis). Evaluating something means just this: to judge its value, considering all factors and circumstances. This means considering the **quality** of something, so an idea or argument should be quality-checked for the following features

- **Success** - the argument or proposed solution must meet relevant criteria
- **Logic** – it must make sense and be rational
- **Evidence** – it must be supported
- **Reliability / credibility** – it must be well researched and verifiable to others
- **Purpose / usefulness** – it must be worth discussing, making some difference in the field, even if it seems only a minor point
- **Relevance / appropriateness** – the proposed solution must be realistic and viable
- **Transferability** – it will probably need to work in other contexts
- **Originality** – if it is not possible to offer an entirely new perspective or new piece of evidence, at least it could be presented in a new context, or with, say, the addition of new factors, even if the issue is an old one

2.5.3 Synthesis

By thinking critically you are likely to find that few issues are really just 'black and white', and similarly that few arguments are wholly right or wholly wrong. Instead you should be able to see the many shades of grey in between, and recognise that combining ideas appropriately is what is required to make sense of existing arguments and to produce your own. Bringing a range of relevant information to bear; including new knowledge as it emerges; drawing upon successful theories and discarding those shown to be incorrect are all essential aspects of academic and scientific processes. This is called **synthesis** and the diagrams below present a very simplified illustration of how you might synthesise arguments:

Figures 7 and 8: Synthesis – a simple example

Statement: 'The sky is blue'

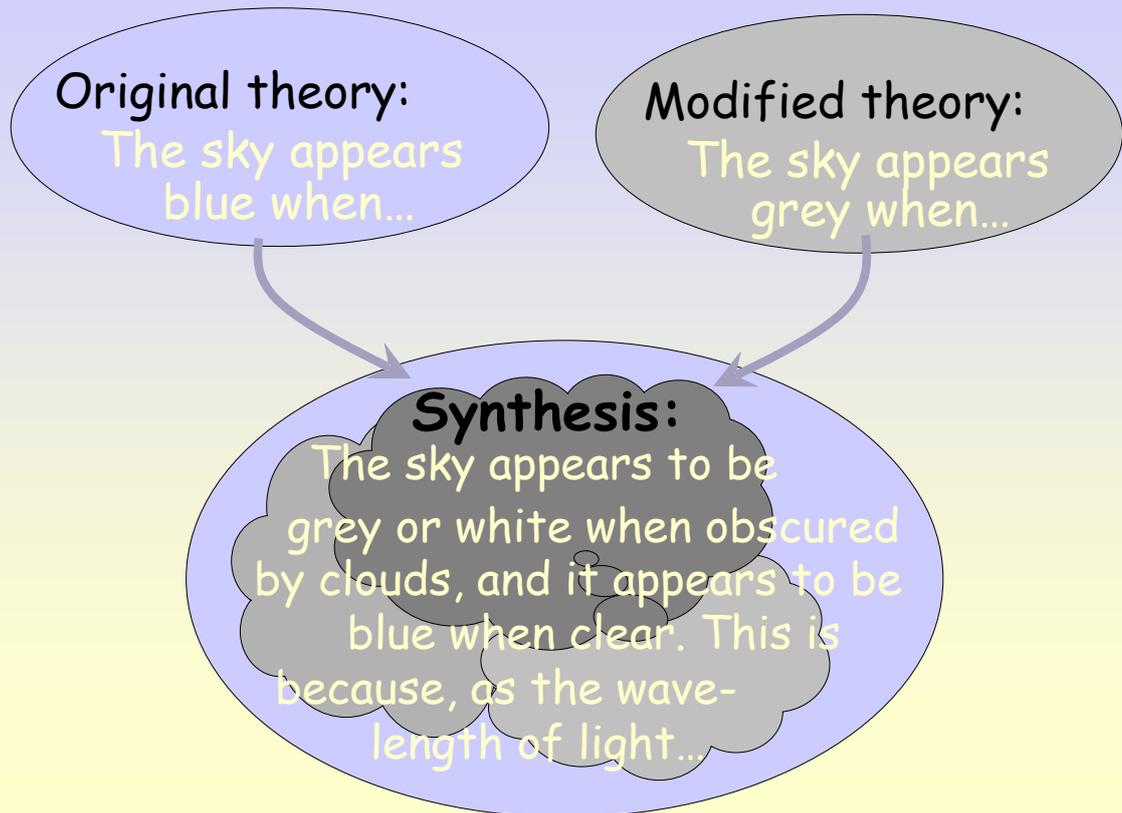
- **Merits**

- This theory is consistent with observations of blue skies
- This theory is *somewhat* consistent with observations of skies with broken cloud

- **Defects**

- This theory is inconsistent with observations of cloudy skies
- This theory is inconsistent with observations of the sky at night

Synthesis: combining observations & theories



2.6 What next?

This might be the last question in each mini-cycle (which could be one thread of an argument, one point or paragraph). Having discussed meaning and implications before, it is now time to ascertain what to do with that knowledge. In the context of, say, report-writing it might be clear that the big 'what next?' question would appear in the 'Recommendations' section. In other types of assignment, such as essays too, although you might not have a separate recommendations section, nonetheless there is likely to be a 'forward-looking' part in which solutions are offered and suggestions are made – e.g. for converting theory into practice. You might think about questions such as

- Does this solution work in other contexts and with other factors in place (i.e. is it transferable)? Where / how else could it be used?
- What other investigation, study, action or planning is needed?
- What can be learnt from the work you have done?

For the purposes of this guide, now we have looked at critical thinking in relation to raw materials, ideas; and the process of turning them into arguments, asking 'what next?' brings you on to the third stage – the 'production' or writing up of your work.

3 The Product: Organising & Presenting Material

3.1 Structure

'Structure' can refer to the overall shape of an assignment, that is, the beginning, middle and end, or introduction, main body and conclusion. Following the Critical Thinking Model, it might look like this

- ✓ Introduction to issue (**description**: answering the questions 'what', 'when', 'where', and 'who')
- ✓ Discussion of factors within issues (**analysis**: 'how', 'why', 'what if')
- ✓ Discussion of meanings and implications overall (**evaluation** of evidence and findings leading to conclusions – answering the question 'so what') Recommendations and plans for further work (what next) might either be included here, or, in some cases, form another section

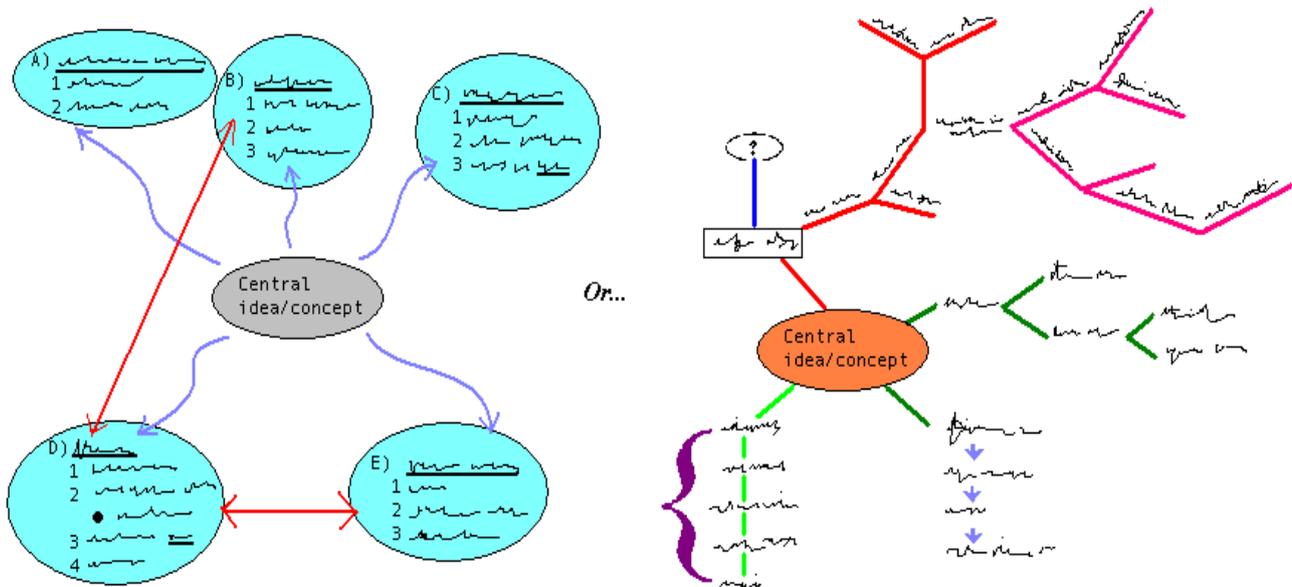
However it is not enough to merely show that your work has a beginning, middle and end. The content, or arguments within it, must also have structure. This means that

- Every key section (even each substantial paragraph) should have a discernible beginning, middle and end, and in terms of the functions fulfilled by the language you use, the structure might look very similar to that of the entire assignment
 - ✓ Introduction to issue (description: what, when, where, who)
 - ✓ Discussion of factors within issue (analysis: how (component parts), why, what if)
 - ✓ Discussion of meaning and implications (conclusion or evaluation: so what)
PLUS – a link to the **next issue**, perhaps presenting a new related problem (**what next**)
- Your line of thought or argument should be logical and clearly expressed, making it easy for the reader to follow you from start to end (see 'signposting' in the diagram on page 31)
- You should avoid getting sidetracked - look again at the early editing tips given in Section 1 above, pages 3 and 10)

3.1.1 'Mindmapping' as an organisation technique

Drawing diagrams like 'spidergrams' or more sophisticated Buzan-style 'mindmaps' (Buzan, 1979) is a good way of organising your material visually and working out the relationships or links between ideas, or the different aspects of a topic. Many people find it easier to do this before starting writing the assignment. Also, by the time you get there you will have done much of the hard thinking work! This makes it a useful tool for planning structure into your work.

Figure 9: Ideas for mindmaps



Pros of drawing a mindmap:

- ◆ The very act of drawing can **help you think** (and recall information) – just try doodling – it doesn't have to be 'artistic' or beautiful!
- ◆ It can help you spot emergent arguments, as sequences, patterns and any previously overlooked links may present themselves in the visual diagram where they weren't obvious in your notes or written text.
- ◆ Graphic representation can aid memory and recall.
- ◆ It is a useful way of **recording and structuring** relatively unstructured input, say, from a conversation or group discussion, as well as that from an organised source such as a book or lecture (see Study Guide 5, Note-taking & Note-making).
- ◆ It is an early **editing** tool. You can decide at this stage which threads of argument you want to pursue and which lead to dead-ends that won't enhance your assignment. It is easier to see what is relevant and select that information, whilst **rejecting what is not** (before wasting more time on it).

Cons:

- ◆ They can become very complex – adding a key might be useful, especially if you use them as a revision tool and need to understand them after a lapse of time.
- ◆ Other people won't necessarily be able to understand it, and likewise you might not be able to follow somebody else's map!

Various kinds of graphic designs can be used for both the brainstorming and planning stages of your work. Study Guide 5, 'Note Taking and Note Making', has further ideas on spidergrams, flowcharts, tables, continuum scales and other useful formats. These can all be helpful for mapping all your material on one piece of paper in a logical way. Making a 'mindmap' or

spidergram can in fact be a continuation of the brainstorming process, with the main difference being that at this stage you can use a spidergram to plot

- Relationships – e.g. cause and effect
- Links
- Groupings
- Relative importance
- Chronology

When the information is organised you can think about constructing a more complex plan showing a logical order of points, evidence and paragraphs, which will help present a clear argument that answers the question set.

Tips

As with the brainstorming activity, you can

- Use keywords
- Use different colours and symbols
- Put issues that are related to each other on the same part of the page
- Link keywords together with different coloured lines or arrows to show relationships
- Circle words with different colours to group or categorise them
- Change the size of words according to their significance or relevance
- Change the position or centrality of words according to importance.

More maps can be made exploring different sections of the original one to allow for more detailed thought, or the first one can be revised to show more logical patterns more clearly. Develop your own system!

3.1.2 Grouping and categorising

This is a good way to start to organise any material, especially elements of an argument. Grouping things helps you to

- Gain an overview
- Prioritise material and points to be made
- Organise subgroups into a logical order and order elements within their subgroups
- Spot differences and similarities between groups
- Talk about common themes
- Compare them to those of another other type
- Manage the task more easily as it is reduced to 'bite sized chunks'.

Example: If your brief is to assess the changing role of the media over the last century, you might break the century into decades to look at trends in each period.

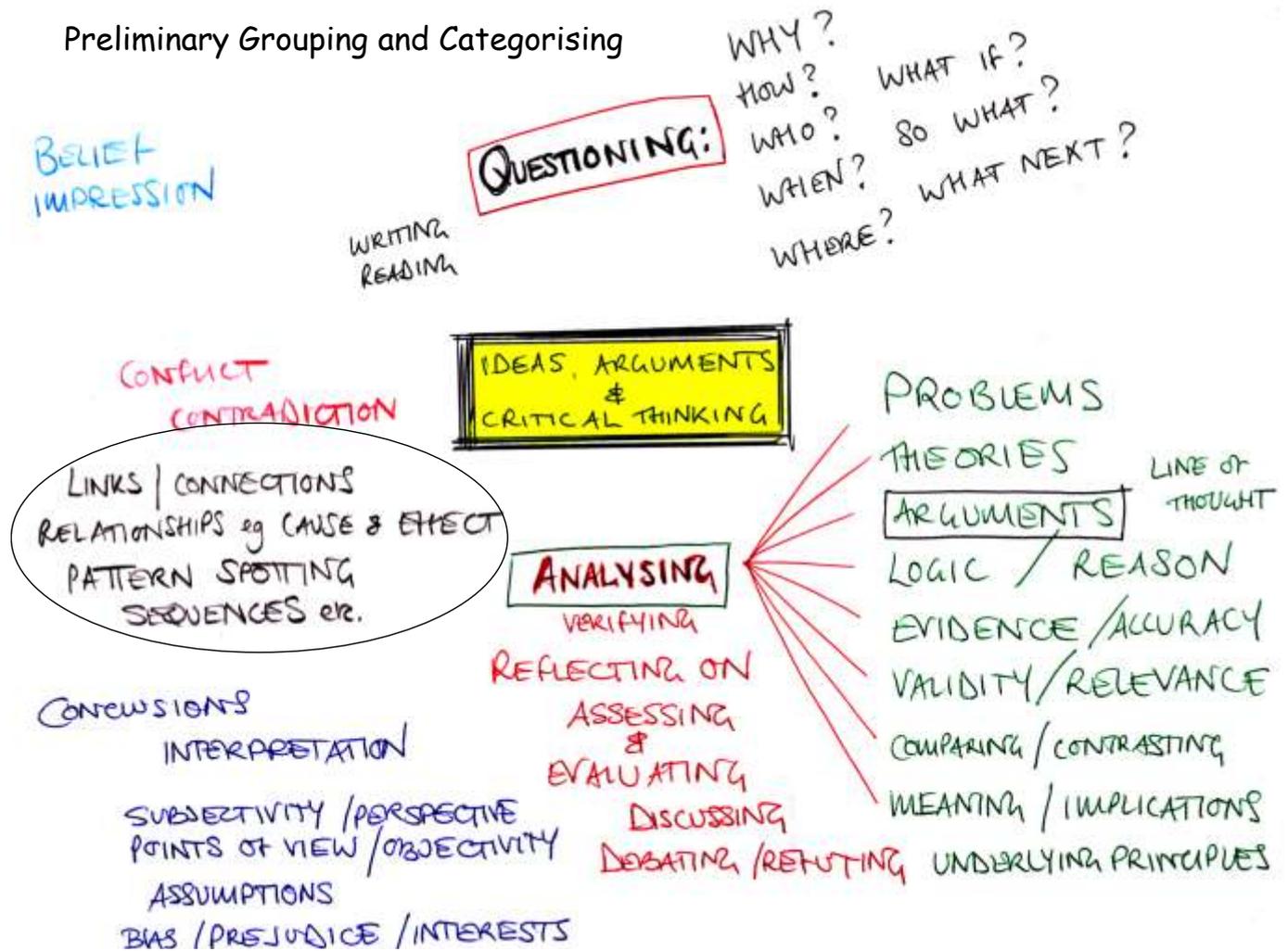
Another approach would be to break the media down into its subgroups – newspaper, radio, cinema, television, internet etc. and consider each one separately before making connections towards the end and making your final comments in the conclusion.

You could look at it another way, and divide your discussion into separate sections addressing the positive, neutral and negative aspects of the role of the media, looking at whether they have become more or less positive and weighing them up at the end to decide on some conclusive argument.

The three diagrams below show the stages of development of this guide. If you study them, you should be able to see the logical progression and development of structure. The first diagram shows a preliminary sketch organising ideas and material for this guide.

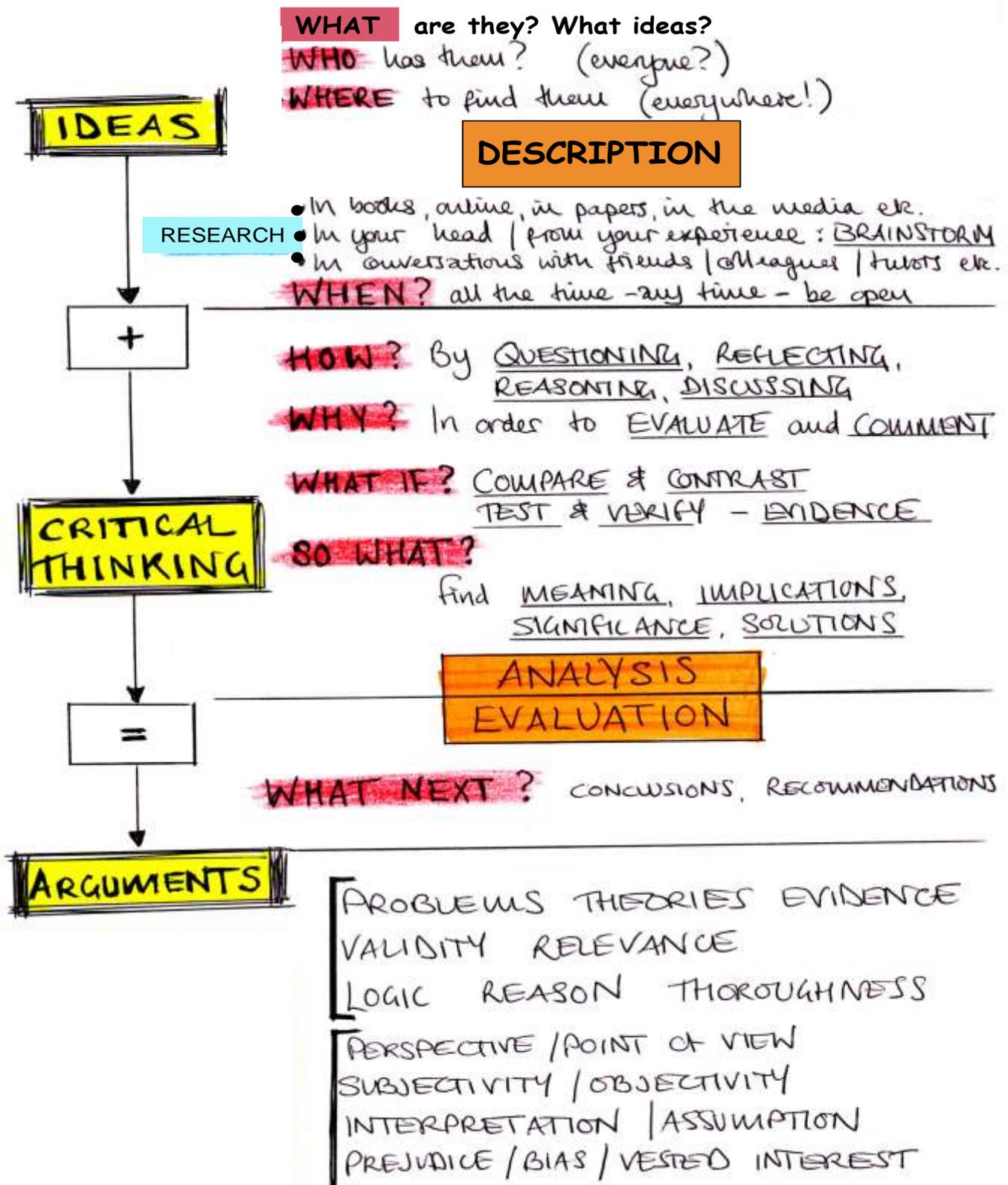
Figure 10:

Preliminary Grouping and Categorising



Once the material had been grouped in this way, an outline plan was made (below). The plan shows the 'critical questions' in action, although in a simplified way:

Figure 11: Planning



This outline plan was refined to produce the map below, which shows the structure of the contents of this guide:

Figure 13: Tips for writing a critical essay

	'DOs'	'DON'Ts'
What?	Answer the question set! Keep referring back to the title - both mentally and in your work	Forget the title. It's amazing how many people do!
What?	Contextualise – give background to help your reader - but include ONLY what is really necessary	Just narrate or 'splurge', telling the whole story starting from the big bang and including everything you ever heard about the topic!
What?	Outline, trace or summarise briefly instead of including superfluous data or detail	Describe in too much detail or include all your data - unless specifically asked to. Reserve your efforts for the most important part of the assignment – the analysis and discussion of the data.
What?	Define your terms, the problem etc	
How?	Show processes in a logical order	Muddle everything in together
How?	Explain subtle points and finer details	State the obvious, repeat or over-explain
How?	Be precise, clear, direct and to the point Be concise: reduce what you say to its essence in both your thinking and your communicating	Be vague or waffle , including detail that doesn't help answer the question
		Oversimplify or see things 'in black and white'
How?	Use definite, specific, concrete language Use terms consistently - stick to one meaning for each, or explain if you need a different usage	Use loaded or deliberately emotive language Use colloquial expressions, phrases or clichés (e.g. the word 'get' can often be replaced by a more specific term appropriate to the context – e.g. 'purchase', 'arrive', 'achieve')
How? / Why?	Use 'signposting' to help the reader follow your thread: provide the reader with strong 'umbrella' sentences at beginnings of paragraphs, 'signposts' throughout, and brief 'so what' summary sentences at intermediate points to help your reader understand your comparisons and analyses (Gibbs and Gambrill, 1999)	Assume the reader knows why you are including the information you are. Instead tell them explicitly why it's relevant and what it shows, so that they can follow your line of thought without having to guess at connections you make in your head
How? / Why?	Emphasise an important point by giving it a prime place in the sentence or paragraph, or by reinforcing it with the language you use, e.g. 'Something which needs particularly careful consideration is...' or 'It may appear that x is the case, but evidence shows that what actually occurs is y'. Give specific examples to illustrate the points you make about how something happens in context.	Repeat the same information in the same or slightly different words in the hope that the reader will not notice that you are padding it out! On the contrary, the reader will definitely notice and will be bored!
Why?	Support and illustrate your claims with appropriate evidence and examples. Exploit	Copy and paste from texts books and articles. Refer to

	the information you have, and show your reading with up to date and appropriate references	books, because they sound impressive, even though you have not read them
How?	Develop your argument to reflect your actual findings and reading	Decide what you think first and then twist the facts or refer to texts selectively to make them fit your claims.
Why?	Analyse and discuss issues, looking at pros/cons, strengths/weaknesses, patterns/trends, connections and complexities, and aim to propose a convincing theory with some input of your own derived from your research	Make unproven assumptions & generalisations , especially from merely anecdotal evidence or personal experience alone
Why?	Persuade & convince , showing why you think what you're saying is interesting, relevant and valid	Rely on persuasive language alone to make your point
Why? / What if?	Start from a reliable premise (e.g. '... smoking has been shown to cause heart disease and lung cancer') and arrive at a reliable conclusion ('... therefore it is reasonable to say that smoking is a health hazard.')	Construct a faulty argument on the basis of a weak premise , e.g. 'There is a strong correlation between people's shoe size and the size of their vocabulary. Therefore having a large vocabulary causes feet to grow.'
Why? / What if?	Make intelligent suggestions, predictions, & hypotheses using appropriate language to show that what is said is a possible interpretation or belief. Useful words are: 'highly likely', 'probably', 'not very likely', 'highly unlikely', 'often', 'usually', 'seldom', 'I suspect', 'most', 'many', 'some', 'it could be said', 'it seems', 'evidence suggests'... Choose 'it could be' rather than saying 'it is'.	Make absolute statements unless stating a very simple non-debatable fact (like 'the Earth is a planet' – and even then it is better to say 'The Earth is considered a planet because...' to allow for the possibility that someone may one day prove otherwise or re-categorise it...)
Why? / What if?	Account for weaknesses in your own argument, rather than leaving them for your reader to criticise – this will undermine your credibility, whereas pointing up your own faults will show thoroughness, and filling in the gaps will help convince	Ignore or overlook faulty logic in your own or others' work
So what?	Comment / pass judgment , giving a reasoned opinion based on evidence analysis (Cottrell, 1999)	Write wishy-washy, descriptive and repetitious comments rather giving an opinion
So what?	Consider and evaluate others' ideas , whether they oppose yours or not	Ignore opposing arguments , as this will weaken your own
So what?	Reject & refute others' theories if you find them unconvincing – AS LONG AS you can justify your response in scholarly terms, i.e. your objections are formed from your research.	Agree with or accept unquestioningly information, argument, theory or the beliefs of others just because they seem like authorities – i.e. have published their written work.
What next?	Make recommendations according to the results of your study and your findings	Moralise or preach , rant, 'get on a hobby horse' or tell people what you think they should do

3.3 An 'Incomplete Guide to Constructing Defective Arguments' (This section has been adapted from Warburton, 1998)

The following examples are intended to be a humorous guide showing how **not** to construct arguments. It should enhance your ability to appreciate sound and faulty logic - and raise your awareness of some common errors.

Error: Ignore alternative explanations

- I become bad tempered if I have a hangover
- I am bad tempered
- **Therefore I must have a hangover**

Error: Be ambiguous

- Thanks for offering to help me hammering in this fence post.
- When I nod my head, you hit it.

Error: Use anecdotal evidence to make sweeping generalisations

- My friend tried acupuncture and it worked.
- **Therefore acupuncture can cure anything.**

Error: Make assumptions

- The meal contains nuts, **so the patients should not eat it.**

Error: Think in black and white

- The patient is **either completely mad, or completely sane.**

Error: Be inconsistent & contradict yourself

- Some people prefer an early start, **but everyone likes a lie in.**

Error: Rely on dictionary definitions that are

- Short
- Vague
- Superficial
- Unrelated to the context of your work

Error: Assume correlations are causes

- There is a strong link between people's shoe size and the size of their vocabulary
- **Therefore having a large vocabulary causes your feet to grow.**

Error: Introduce 'red herrings' (irrelevancies)

- Let's consider whether music should be taught in schools
- **My great grandmother used to send me to sleep by playing lullabies on the trombone**

Error: Be economical with the truth

- Only three severe adverse reactions have been recorded
- **[This week]**

Error: Use emotive language

- This kind of **stupidity** is the main threat to the health of our precious young people

Error: Present formal fallacies: the starting point's OK, but the conclusion doesn't follow

- Witches keep black cats
- The lecturer keeps a black cat
- **Therefore the lecturer is a witch**

Error: Use unnecessary jargon:

- The French **modus vivendi** is too **laissez faire** (The French way of life is too relaxed / laid back)

Error: 'kowtowing' (bowing low in extreme humility / being sycophantic), or being overly deferential to people with some sort of elevated status, accepting their ideas without criticism just because of who they are:

- Nietzsche, **who was really famous and wonderful and knew everything**, said to take a whip when approaching a woman, **so it's ok to hit your wife**

Error: Introduce non-sequiturs (statements that bear no relation to what comes before), and advertise them with a spurious 'so' or 'therefore'

- Many cats have tails
- Some cats like milk
- **So the corner shop will be closed on Sundays**

Error: Use persuader words

- **Obviously** we should follow every instruction issued by a doctor

Error: Make rash generalisations

- From the two case studies, it is clear that this outcome **is inevitable for** measles patients

Error: Generalise research findings inappropriately broadly by writing 'research has shown that' followed by absolute statements:

- Nuts **are** poisonous to people
- The earth **is** flat
- Bumble bees **cannot** fly

Error: Employ wishful thinking

- Clearly sending all patients home at this stage will reduce the cost of care without significantly impairing the patients' recovery

3.4 Descriptive versus critical-analytical writing

For the sake of a clear, simplified and practical guide to critical thinking, we have talked of **description**, **analysis** and **evaluation** as the three key functions in developing an argument and in presenting or writing a university assignment. We have linked these to the main stages of planning and writing up, as well as to the structure of the finished essay or report: the introduction, the main part and the conclusion. In reality, of course, it is not possible to distinguish description absolutely from analysis or evaluation. As soon as we start to say **what** something is, we are already **explaining** something of its use ('... a chair is an item of furniture designed to support humans when sitting ...'); and a useful **description** might also include **evaluative** information ('... chairs are used in offices, although sofas, providing greater comfort for visitors, are sometimes used in reception areas ...') This is because the tools we use for making sense of the world rely on language, which can never be 100% factual or devoid of the possibility of variable human interpretation, bias or cultural influence.

It remains true, nonetheless, that to explore, understand and live practically in our world, we need to study it, plan, take action and then communicate what we have done or discovered in ways that 'make sense' to others. In part, this means to tell a clear story in language that can be understood - and believed because evidence and supporting information is provided. It also means being systematic and rigorous so that experiments or practices can be repeated and tested. The critical thinking cycle therefore involves work in whatever it is you are learning: usually beginning by describing, then using your descriptions to analyse, develop and test theories to aid understanding; then making judgments or evaluations so that you can decide what to do or investigate next ... and so on. Science, art and industry all do these things, albeit in their own ways, with their own sets of rules, customs or conventions. It's not surprising therefore that we find this cycle reflected in various ways, and to varying degrees, in scientific work and academic texts – and even in novels and plays, in newspaper articles and business reports. Your university studies are academic work and need to demonstrate your scholarly qualities. The critical thinking cycle can help you, both to carry out your work and to organise how you present and write it up.

Descriptive writing is characteristically factual. It often appears at the beginning of assignments to introduce the topic and give background information. Level one assignments will often be quite descriptive when the brief includes words such as 'describe' and 'identify'. As we have seen, description typically responds to the **what**, **where**, **when** and **who** questions. However, as well as describing simpler subjects such as events, situations and occurrences it can also describe more complex things like processes, problems and theories. Here we begin to move into the '**how**' and even '**why**' questions, and description becomes analytical.

Figure 14: Starting with description and moving towards analysis using the 'critical questions'

Example: Description		Description becomes analysis:	
What?	A cup (vessel)	How?	By containing liquid
Where?	In the home	Why?	To store it temporarily and stop it spilling
When?	For several millennia		
Who?	Everybody		

'A cup is a vessel found in every home and used universally in one form or another. It has evolved over several millennia from found structures such as seeds or gourds (still used among some tribal peoples), through hand-made ceramic vessels to industrially-produced manufactured materials. Whatever the shape and materials, its function remains the same, that of storage, and our reliance on it is just as heavy.'

Critical analytical writing investigates and then comments on the problems, underpinning values and underlying themes surrounding events, theories, processes and so on. It is characterised by the importance of argument – that is, well-researched discussion, carefully considered reflection and informed opinion. This is generally the most interesting part of an assignment, and usually a highly important element in most disciplines and in most projects of level two and above. As you will see in the box below, in analysis '**how**' and '**why**' are followed by '**what if**':

Figure 15: Analysing and evaluating using the 'critical questions'

Example: Analysis

How... ...is it made?
Why... ...is it made this way?
What if... ...it were made another way?

'Although a vessel may seem a simple object with a simple function, there are still certain properties it must have in order to succeed. To contain liquid the fabric of it must not be overly porous or have holes, so ceramic might be better than wood. It must be rigid enough for the sides not to subside and spill the contained liquid, so cloth for example would not be effective without a frame – and then it becomes an unnecessarily complex structure. It must be of a size that is easily manageable (i.e. not too heavy) and it must be easily held (hence the evolution of the handle). Lastly it must be durable and not easily breakable.

This last criterion has been overcome in plastic cups, which might be made by pouring hot liquid into a mould and allowing it to set. However there are problems associated with this process, such as harmful environmental impacts of

the fossil fuel industry. Also plastic is often not considered aesthetically desirable – some people find it uglier than ceramic.

Using metal might seem like a solution in some ways, except it might pose new problems to do with heat radiation as well as perhaps affecting the taste of the liquid...'

Analysis becomes evaluation:

So what? Problem not solved
What next? Examine other possible solutions

This passage might continue like this: 'So the problem of durability has not been entirely resolved as no completely successful solution to breakage has been found.' This would (briefly) answer the 'so what' question where evaluation would come into play, and the 'what next' response might indicate that further investigation of materials was required.

Cottrell (1999:23) summarises the differences between descriptive and analytical writing as follows:

Figure 16: Aiming for writing that does more than just describe

Descriptive writing	Critical-analytical writing
States what happened	Identifies the significance
States what something is like	Evaluates (judges the value) strengths and weaknesses
Gives the story so far	Weighs one piece of information against another
States the order in which things happened	Makes reasoned judgments
Says how to do something	Argues a case according to evidence
Explains what a theory says	Shows why something is relevant or suitable
Explains how something works	Indicates why something will work (best)
Notes the method used	Indicates whether something is appropriate or suitable
Says when something occurred	Identifies why the timing is important
States the different components	Weighs up the importance of component parts
States options	Gives reasons for selecting each option
Lists details	Evaluates the relative significance of details
Lists in any order	Structures information in order of importance [etc.]
States links between items	Shows the relevance of links between pieces of information
Gives information	Draws conclusions

4. Summary: Defining a Critical Thinker

This section highlights the main points covered previously, and can be used as a quick guide.

Critical Thinking is about:

- Questioning information rather than accepting it – accuracy, completeness, date, source, possible bias, values and attitudes, perceptions, judgments
- Providing more than description or repetition of what others say
- Giving your own views with evidence
- Making reasoned judgments

(Cottrell, 2005)

It involves:

- Asking for reasons*
- Standing back from the information given
- Examining it in detail and from many angles
- Checking closely whether it is completely accurate
- Checking whether each statement follows logically from what went before
- Looking for possible flaws in the reasoning, the evidence, or the way the conclusions are drawn
- Comparing the same issue from the point of view of other theorists or writers
- Being able to see and explain why different people arrived at different conclusions
- Recognising strengths in opposing arguments *
- Being able to argue why one set of opinions, results or conclusions is preferable to another

- Being on guard for literary or statistical devices that encourage the reader to accept a particular stance
- Checking for hidden assumptions
- Checking for attempts to lure the reader into agreement.

(Adapted from Cottrell, 2007 except *: Colorado State University Writing Center, 2004)

Critical Thinkers

- Ask questions
- Seek reasons
- Consider merits and defects
- Consult others, discuss and debate
- Make informed judgments

which requires:

- ◆ Thinking about thinking

and:

- Thinking through implications
- Integrating values and experience
- Being aware of and constantly reviewing their own assumptions, preconceptions and beliefs
- Being able to generalise; to apply and transfer knowledge from one context to another
- Identifying and relating patterns
- Contemplating underlying themes, issues, concepts and principles
- Understanding how details fit into a larger framework *
- Seeking, exploring and evaluating alternative perspectives and opposing views
- Not accepting arguments without considering the evidence and reasoning
- Considering competing theories and developing your own *
- Thinking creatively and laterally to solve problems
- Making sound, well informed, clearly explained plans and decisions
- Keeping up to date; reading plenty

(adapted from Brown and Rutter, 2004, except *: Princeton University Writing Center, 1999b)

Other guides:

Consider using other study guides in this series, in particular numbers 4, 5 and 6, 'Reading Effectively', 'Note-taking and Note-making' and 'Planning and Writing Essays'.

Contacts:

Learning Development Advisors are available to help all University of Plymouth registered students with a range of study-related issues:

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Feedback: Is this guide clear and easy to use? Any questions or feedback to help us improve this guide are very welcome: email learn@plymouth.ac.uk

References

- Bloom, B. S. (ed.) (1956) *Taxonomy of educational objectives*. New York: Longmans
- Bowell, T. and Kemp, G. (2005) *Critical thinking, a concise guide*. Abingdon: Routledge
- Brown, K. and Rutter, L. (2004) *Critical thinking and analysis: a guide to enhancing reflection, learning and writing for post qualifying social work programmes*. Bournemouth: University of Bournemouth
- Burns, T. and Sinfield, S. (2004) *Teaching, learning and study skills*. London: Sage
- Buzan, T. (1979) *Use your head*. London: BBC Books
- Colorado State University Writing Center (2004) 'Academic Argument' [online]. Available from: <http://writing.colostate.edu/> [accessed 25 May 2008]
- Cottrell, S. (2007) *The study skills handbook*. 2nd edn. Basingstoke: Palgrave Study Guides
- Cottrell, S. (2005) *Critical thinking skills*. Basingstoke: Palgrave
- Creame, P. and Lea, M. (2003) *Writing at university, a guide for students*. Maidenhead: Open University Press
- Elbow, P. (1998) *Writing without teachers*, New York: Oxford University Press
- Gibbs, L. and Gambrill, E. (1999) *Critical thinking for social workers: exercises for the helping professions*. Thousand Oaks, CA: Pine Forge Press
- Moon, J. (1999) *Reflection in learning and professional development: theory and practice* London: Kogan Page
- Princeton University Writing Center (1999a), 'Developing a Central Idea' [online]. Available: http://web.princeton.edu/sites/writing/Writing_Center/Handouts/DevelopingaCentralIdea.pdf [accessed 19 May 2008]
- Princeton University Writing Center (1999b), 'Logic and Reasoning' [online]. Available: http://web.princeton.edu/sites/writing/Writing_Center/Handouts/logic&reason.pdf [accessed 19 May 2008]
- Thomson, A. (2002) *Critical reasoning, a practical introduction*. Abingdon: Routledge
- Warburton, N. (1996) *Thinking, from A to Z*. London: Routledge