Enhancing Your Learning and Writing with Mind Maps, Concept Maps, Flow Charts, Tables etc.

What do mind maps, concept maps, tables etc. have in common?
They organise information in a spatial or graphical way, thus helping you to see the structure and organisation of ideas (and so will be referred to collectively as “graphic organisers”).

Why use them?
The human brain has been adapted to be a pattern finding organism, so putting concepts and ideas into an organised structure works with the brain’s strengths, aiding understanding and learning. They also help overcome information overload and the limitations of working memory (i.e. that you can only keep a limited number of thoughts in mind at once). As succinct summaries though, they are only meaningful after the necessary preliminary reading or thinking has been done.

What are they good for?

| Mind maps | Structured brainstorming of an assignment topic analysis. |
| Argument maps | Sorting out a complex web of alternative arguments about an issue, the supporting evidence and counter-arguments and evidence. |
| Concept maps | Understanding complex, multi-component concepts. |
| Tables | Comparing and contrasting theoretical perspectives or approaches to something. |
| Flowcharts | “Chunking” the steps of a long and complex process to make the process more manageable. |
| Decision trees | Providing a structured approach to problem-solving. |

Some software products for mind/concept/argument mapping:
Inspiration [http://www.inspiration.com/]
Rationale [http://www.austhink.com]
Visimap [http://www.coco.co.uk/]
For a list of freeware and commercial software products, see:

Tables: Identifying patterns in concepts
One use of tables is to use them to see and learn patterns in concepts. For example, consider the following table on human blood groups.

<table>
<thead>
<tr>
<th>Blood Group</th>
<th>Antigen on red blood cells</th>
<th>Antibodies in plasma</th>
<th>Can’t receive blood from</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>anti-B</td>
<td>B, AB</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>anti-A</td>
<td>A, AB</td>
</tr>
<tr>
<td>AB</td>
<td>A and B</td>
<td>None</td>
<td>none</td>
</tr>
<tr>
<td>O</td>
<td>none</td>
<td>anti-A and anti-B</td>
<td>A, B, AB</td>
</tr>
</tbody>
</table>

There are a lot of individual pieces of information in this table, but if you learn the pattern as indicated by the explanatory notes (which is much less information), then there is much less to learn because all the details can be reconstructed from the one pattern.
Tables: Comparing and contrasting theoretical perspectives or approaches to doing something

Another use of tables is to provide a structured way of comparing and contrasting approaches to something or different theoretical perspectives in some field. By putting the things you want to compare next to each other in the columns of a table, it makes it easier to make the comparisons than is the case if the things come one after the other in a body of text. An example of this is as follows.

Original Text: (Underlining added to identify structure for table below.)
“... When we look at how our industrial relations system has changed over time we can see it’s been part of a shift in Australian's values and priorities. Australia’s first industrial relations system was developed in the early 1900s, and consisted of a centralised arbitration system. In this system workers banded together into unions to take on the bosses. The unions were organized by occupation and they went up against all the bosses of a particular sector. A central government authority acted as the umpire. It listened to both sides and set wages and working conditions. In the 1990s under Paul Keating, we made a significant shift to enterprise bargaining. Under this system unions were based around the individual businesses. Workers negotiated with their own bosses, and came up with arrangements for that individual business. Finally under Howard there has been a decisive shift towards individual contracts. Under this system workers negotiate directly with their bosses, and there is only a minimum safety net. Each of these models is based on quite different values about what contributes greatest to community well being. As we’ve shifted models, we can see a gradual shift in Australian values.

Let’s explore the three major values divides between the models. The first issue is whether our work lives should be centred on delivering workers quality of life or maximizing business profits. Under the centralized wage fixing system, .... Under enterprise bargaining and individual agreements, the emphasis has shifted. People's working lives are expected to .... And we've moved to assuming ....

The second values divide between these models is the way we balance protecting the vulnerable and allowing flexibility to the go-getters. On the one hand, arbitration put rigid rules in place to protect the vulnerable, but it restricted flexibility. Enterprise bargaining offered some protection and some flexibility. Meanwhile, individual contracts prioritize flexibility and the worker or new business owner who is prepared to charge into the corner office and hammer out a deal that suits them.

The final values divide between these three models is all about the best way of dealing with conflict. Industrial relations experts have often been fearful of enterprise bargaining. They were concerned it leads to two sides of similar power, and no arbitrating force between them. In the late 1980's and early 1990's, everyone was worried that it would create a lot of strikes. The other two systems, arbitration and individual contracts, are both considered to be better at dealing with conflict, but they've got divergent philosophies on how to settle it. Centralised arbitration set up .... Advocates of individual contracts have also argued that their approach reduces conflict. The argument is that ....”

Adapted from a Transcript of “Perspective” (Radio National) from 18/9/07

One way the above text could be organised to make it easier to learn or use in an assignment would be to excerpt the key points into the following table.

<table>
<thead>
<tr>
<th>Model Description</th>
<th>Centralised Arbitration</th>
<th>Enterprise Bargaining</th>
<th>Individual Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values Differences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker quality of life vs business profits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protecting vulnerable vs giving go-getters flexibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best way of dealing with conflict</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The various IR approaches you want to compare and contrast.
**Mind Mapping a Topic Analysis**

Mind maps provide a structured way of brainstorming an analysis of an issue. A mind map also has the advantage of getting you to think about themes and questions rather than about what any one particular author said, which is a better way to organise your assignment. As ideas tend to sprawl sideways across a page, mind maps are best done with your page in landscape format (i.e. on its side).

### Developing a mind map:

1. Put your central issue or question in the middle of the page.
2. Off this, put the major sub-issues/themes or questions you think you will have to address. Don’t worry about order at this stage, as the advantage of a mind map is that you can put these down in any order.
3. Under each major sub-theme, break into further sub-themes or questions, give examples or maybe list relevant theories and/or applications and examples to bring in.
4. As new ideas occur to you, you may go back to previously done sub-themes and add things, thus keeping related ideas together.
5. There may also be links between different items on your mind map that you might wish to pencil in.
6. Once you have finished your mind map, you can use it to fine tune your research and to work out a logical order in which to address all the themes and questions you think need addressing. You might record your thoughts on order by giving a number to each major section or subsection.
7. It may be necessary to rework your map a couple of times once you work out the best way of organising the ideas and what the natural hierarchy of ideas is (i.e. branching from the middle should be from broad to narrow).


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**A mind map** can also be used after you’ve done your research to sort what you’ve found into a hierarchy of issues/themes and examples/applications. Once you’ve mapped out all the things you want to say, then you can think about what a logical order for saying them would be. This approach is particularly useful when you’re finding it hard to get your ideas organised because there’s just too many to fit in your head at once.

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**Should media coverage of women’s sport be more equitable?**

- Why does it matters? (i.e. why is difference inequitable?)
- Links between media coverage, sponsorship, & development.
- What differences are there in the coverage of male vs female sports?
- Differences in whole game versus news (i.e. highlights/results) coverage?
- Is it “fair” on media to require coverage of sports, male or female, which don’t have high potential audience numbers?

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**What governs level of coverage?**

- Audience interest?
- Actual?
- Perceived?
- Biases of media bosses?
- Socio-historical reasons?

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**“Equitable” means “fair,” but does “fair” mean “equal”? If “unequal” can be “fair,” what criteria determine what is “fair” in this case?**

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**It matters if it is sex discrimination.**

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**What is “fair” for women and what is “fair” for commercial media outlets?**

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**Is it a form of sex discrimination?**
Argument Maps

Argument maps are useful for sorting out the various arguments, counter-arguments and counter-counter-arguments that have been presented in relation to some controversial issue. (For more, see: http://www.austhink.org/critical/pages/argument_mapping.html)

**Issue: Can mental attitude affect biological disease?**

**Counter-arguments**

**Supporting evidence**

**Result could be due to factors other than psychological state, such as not eating properly or sleeping well.**

**Counter-arguments**

**Result could be due to antidepressant medication, or the depressed patients may not have ate or slept as well as the non-depressed.**

**Hypothesised mechanism:**

At the UK's Common Cold Unit, people who had experienced a stressful event in the last 6 months who were deliberately exposed to Cold causing viruses got worse colds than a control group (Totman, Craig and Reed).

Schleifer et al. (19??) showed that depressed patients matched for age, sex and race with non-depressed volunteers, had significantly lower lymphocyte responses than did the non-depressed volunteers.

In 19th century, TB was believed to be caused by a certain personality type, but later found to be caused by the tubercle bacillus (Sontag, 1977). Therefore, current beliefs of impact of personality on diseases such as cancer also likely to be found wrong.

**Conventional medical view:**

Large study of cancer patients found no correlation between the progression of the disease and a range of psychosocial factors (Cassileth et al., 1985).

Proving psychological factors do not cause a disease is not the same as proving that psychological factors do not influence susceptibility and progression of disease.

Were the right psychosocial factors tested?

Proving mental attitude has no effect on cancer does not necessarily prove it has no effect on any biological diseases at all.

A different style of argument map which looks at how premises lead through to a conclusion and which aids the development of critical thinking is discussed in: W. M. Davies (2009), Computer-assisted argument mapping: a Rationale approach, Higher Education, 58(6), 799-820. DOI 10.1007/s10734-009-9226-9.

See also the online tutorial at: http://austhink.com/reason/tutorials/index.htm and the example on the next page.
Notes
- An argument consists of a contention (or claim), together with reasons or objections. Reasons/objections are made up of premises.
- Horizontal groupings of premises indicate that they are co-premises needed for a complete reason.
- For a university essay, you would also need to have appropriate references to support each of your premises.
- An essay consists of an overall argument supported by sub-arguments. Mapping out your sub-arguments can help you establish and improve your overall argument.
- Once you have a complete map, you could number sub-parts in the order in which you think you can most logically proceed through your arguments.
- To get a better understanding of argument mapping, see:
  - the argument mapping tutorial at: http://sushink.com/reason/tutorials/index.htm

Argument Map Key
- Blue box = claim (thesis)
- Green boxes = supporting reasons
- Red boxes = opposing reasons or rebuttals

Argument map for the essay topic: Diversity: Help or hindrance to group performance?

There are many ways that diversity can hinder team performance, though there are things that both teams and their managers can do to reduce the potential negatives and enhance the potential positives.

Differences in attitudes to time management and the task can lead to interpersonal conflict.
Interpersonal conflict leads to poor social integration.
Poor social integration leads to lower group performance.
Differences in knowledge, experience and skills can lead to synergistic knowledge development (SKD).
SKD is linked to greater creativity.
Demographic differences, like age, gender and ethnic background can generate negative stereotypes.
Negative stereotypes negatively affect team social integration.
Poor social integration leads to lower group performance.
If teams agree on positive norms, team social integration can be achieved despite differences.

Some of these differences can be managed by agreed upon rules.
Differences in views on how to view/tackle the task can lead to counterproductive interpersonal conflict.
Too many ideas can lead to cognitive overload.
Cognitive overload can stall decision making.
Frequent collaboration can help moderate negative stereotypes.
Too much social integration can result in team members worrying more about maintaining good personal relationships than about having robust debates.
Robust debates are needed to get the best thinking out of a team.

Agreed norms about fostering team psychological safety can help prevent this from happening.
**Decision Trees**

Decision trees provide a structured way of making decisions about a course of action. They work by getting you to answer a series of questions from broad to narrow, and depending on your answer, you get taken down different branches of the tree. As such they can aid “diagnostic” processes in medicine and law for example. The following example looks at part of a decision tree for deciding which elementary statistical test to use in which situation for normally distributed data.

**Number Of Samples**

**One** (testing claim about population)

- Population Proportion
  - If np > 5 and nq > 5, use \( z = \frac{\hat{p} - p}{\sqrt{\hat{p}\hat{q}/n}} \), \( \hat{q} = 1 - \hat{p} \)

- Population Parameter (E.g. Height, IQ)
  - Population standard deviation known: use \( z = \frac{X - \mu}{\sigma/\sqrt{n}} \)
  - Population standard deviation unknown: use \( z = \frac{X - \mu}{s/\sqrt{n}} \) if \( n > 30 \)
  - use \( t = \frac{X - \mu}{s/\sqrt{n}} \), \( \text{df} = n - 1 \) if \( n \leq 30 \)

**Two** (Comparing two populations)

- Population Proportions
  - Use \( z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{p'q'(1/n_1 + 1/n_2)}} \), \( p' = \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2} \), \( q' = 1 - p' \)

- Population Parameters (E.g. Height, IQ)
  - Independent samples
    - Large samples \((n_1, n_2 > 30)\): use \( z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}} \)
  - Small samples: use \( t = \frac{\bar{X}_1 - \bar{X}_2}{s_p\sqrt{1/n_1 + 1/n_2}} \), \( \text{df} = n_1 + n_2 - 2 \)
    - \( s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2} \)

- Dependent (paired) samples (E.g. Before and after study)
  - Use \( t = \frac{\bar{X}_d - \mu_d}{s_d/\sqrt{n}} \), \( \text{df} = n - 1 \). \( d \) is for “difference” (i.e. after result – before result)

**Many**

ANOVA
**Concept Maps**

- Particularly useful when you’re having trouble seeing how all the pieces of your course fit together and you want to get your knowledge better organised to aid learning, understanding and your ability to apply your knowledge to the solution of problems.
- To create a concept map:
  1. Brainstorm a list of concepts that are related to an overall concept.
     (E.g. for a concept map on “waves”, sub-concepts include things like: amplitude, wavelength, frequency, energy, momentum, …)
  2. Put the overarching concept at the top of the page (e.g. “waves”), then explore different major sub-concepts along different branches.
  3. Concepts occur at nodes in the map, while the connection between concepts is indicated on the links. Extra explanations can go in side boxes.
  4. Illustrations and colour-coding can be used to increase the memorability of a map and to easily distinguish visually between different clusters of ideas.

**Partial Concept Map for the Effects of Diversity on Group Performance**

Another way of capturing the above information is to map out causes and effects which are indicated by the arrows in the figure below. Such diagrams can be useful when studying cause and effect relationships in complex systems of any sort, and are commonly seen in biology texts where they are used to describe systems in the body, ecological systems and so on.

Flowcharts

Flowcharts are used to break complex processes down into a series of smaller, more manageable steps, each of which may be quite complex in themselves, but more manageable. They can be used to schematically describe a complex system, as is the case with the water recycling process illustrated below. Another use is in writing computer program code, where the things the program has to accomplish are broken up into modules which can be written somewhat independently of the other modules. Complex mathematical problems can also be usefully “chunked” into a series of more manageable sub-steps. (Compare with breaking an oral presentation down into the points to be discussed on each of a sequence of PowerPoint slides. While trying to develop and remember the talk as a whole might be quite daunting, developing and remembering what to say about each individual slide is much less so.)

Source: http://www.edwardsaquifer.net/treatme.html

Flowchart of ideas example (also a form of argument map)*