THINKING AND REASONING SKILLS

SKILL 8: CONCEPTUAL THINKING

This is one of the wider thinking skills, it makes us think in ways we might not usually think. Here we challenge our brains to go beyond the surface of a definition or concept, by considering its properties, meaning and its relationship with other concepts. Challenging ourselves to think in this way makes us less likely to accept what we read and hear at face value – a useful skill in any context!

By teaching and assessing this skill, the aims and objectives are as follows:

USING MAPS AND DIAGRAMS

Teach students how to use Venn Diagrams conceptually to explore similarities and differences.
Teach students how to use mind mapping to explore connections between different ideas.

STUDENTS SHOULD BE ABLE TO:

Come up with differences and similarities between two or more things, using a Venn Diagram.
Draw visual maps to show how different ideas connect up with each other .

EXAMPLES

Teachers should aim to:
Expose students to a range of examples with shared properties and guide students in identifying commonalities between them.
Guide students in coming up with examples and counter-examples to clarify the meaning of a range of concepts.

STUDENTS SHOULD BE ABLE TO:

Look at more than one examples and spot properties that they share with each other.
Come up with examples of your own that would fit with a particular meaning of a concept and think of examples that would show a different meaning.

DEFINITIONS

Teachers should aim to:
Expose students to a range of definitions in which certain conditions apply.
Guide students in deciding whether a particular condition of a definition is necessary or sufficient.

STUDENTS SHOULD BE ABLE TO:

Tell whether a certain factor is a necessary or sufficient to its definition.

ANALOGIES

Teachers should aim to:
Explain what is meant by the term 'analogy'
Expose students to a range of analogies.
Give students practice and guidance in evaluating the strength of an analogy by exploring its similarities and differences.

STUDENTS SHOULD BE ABLE TO:

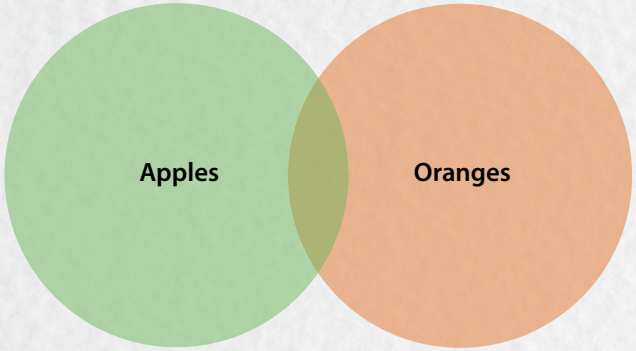
Spot when an analogy is being used.
List similarities and differences between two things being compared and make a judgement on whether an analogy is strong or weak.

USING MAPS AND DIAGRAMS

Diagrams can be extremely helpful – they help us to organise our thoughts systematically so that we can see things more clearly.

The brain is very complex, and our thoughts are not always clearly ordered, so diagrams and maps are a useful tool to organise our thinking on paper.

Venn Diagrams come in handy when we are trying to explore the relationship between two ideas or two sources of information. Have you ever heard the phrase 'Apples and Oranges'? People say this when they believe that you have made a comparison between two things that aren't really similar enough to be compared. Let's have a look:



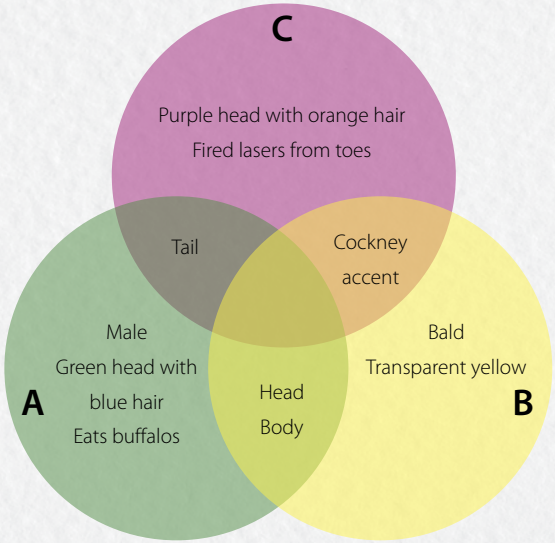
Each circle in a Venn Diagram represents a certain concept or category – in this case apples and oranges. Where the circles overlap we write down the things that apples and oranges have in common e.g. they are both fruits. Where the apple circle is separate from the oranges circle we write down the things which apply to apples have/do/are but at do not apply to oranges e.g. they have a core, you can eat the skin etc. We then do the same for oranges in the separate section of the oranges circle.

DID YOU KNOW?

So, our hazy, jumbled up thoughts about how apples compare to oranges, become organised and clear on paper in the form of a diagram. We can then see clearly whether or not apples and oranges are comparable.

With concepts, this is useful when we are trying to clarify its meaning or definition, or if the reasoning in an argument depends upon the strength of a comparison (we'll look at this later).

The Venn diagram technique also comes in handy when we are analysing evidence. Imagine a situation where we have three people claiming to have encountered an alien on the beach in Bognor Regis, for example. If we are to take these claims seriously, we need to find out what exactly people have seen, so we want to clarify any similarities and differences in the accounts. A Venn Diagram with three circles to represent each witness might look like this:



What we can now see is that Person A, B and C all have very different memories as to the appearance of the alien's head; person A and B both think it was tall; person B and C both think he spoke with a cockney accent. In fact, the only think that all three accounts have in common is that it was male. We can now start to hypothesise. Was this a drug related hallucination? Were there three different aliens on the beach in Bognor Regis that day?
Does this alien have the power to change colour at will?

Either way, we have organised the available evidence in a way that makes analysis easier to do, thanks to a simple Venn Diagram.

The following support materials can be found within the **Skill 8 pdf portfolio**.

8.01 Using Venn Diagrams to explore similarities and differences.ppt

Mind mapping or 'concept mapping' is a technique for organising our thoughts on paper. You may be familiar with this as a revision technique (if not, try it!) because it can help to trigger our memories about certain details. The basic principle of a mind map is to start with a key or central idea in the centre of a page, then draw out from it to make connections between details associated with that idea. This can really help when trying to clarify a concept- we start off by writing the concept in the centre of the page e.g. justice, then we draw lines from that to where we write the main ideas that stem from that concept e.g. punishment, wealth, fairness, equality. We then repeat the exercise with those ideas using lines to connect up any links and before you know it you have a complex web of ideas that provides a really useful source of information about the concept you started with. You can use pictures too, if that helps.

There are lots of software packages that allow you to do this electronically, but good old pen and paper works well too.

EXAMPLES

When trying to clarify the meaning of a concept, people often give examples instead of definitions, particularly when something is difficult to define. For example, if someone asked me 'What is honesty?' I might struggle with a definition on the spot and give a couple of examples: 'Honesty is when, for example, you tell someone the truth about how they look when they ask you. Another example is when you own up to being undercharged in a shop'.

Both of these examples tell us something different about honesty, but they don't give us a clear definition.

Task: Consider the lists of examples given below. What does each list have in common?

List 1	List 2	List 3	List 4	List 5
Poppy	Liverpool	Cheese	Tuna	Birthday
Lily	Manchester	Potato	Crab	Illness
Daisy	Durham	Pork	Mermaid	Apology
Rose	Chester	Cherry	Jellyfish	Birth

This can be made easier using a Venn Diagram to see where they overlap. The things that apply to all of the examples are called 'common properties'.

Thinking up examples to get across what is meant by a particular word or idea can be a good starting point for a definition, as long as you can then work out their common properties to arrive at a good definition.

Task:

(i) Consider how you might try to define these concepts, by coming up with as many examples as you can for each:

Fruit

Animal

Tree

Happiness

(ii) Using your lists, try to come up with a definition for each concept

In this task, you probably found it much easier to come up with a reasonable definition after listing lots of examples. The real test of a definition, though, is to test it against every possible example to make sure that it applies. Sometimes, by doing this we find that our definition isn't quite right.

Let's take 'fruit', for example. You might have listed lots of fruits: apple, mango, strawberry, guava...

Your definition, then, might look something like this: A fruit is something that grows on a tree or bush.

This definition fits with all the examples given above, so it seems to do the trick. However, we can come up with several examples of things that grow on trees or bushes that are not fruits e.g. leaves, nuts, and also examples of things that clearly are fruits but do not grow on trees or bushes e.g a pineapple (which grows as an individual plant) – these are called counter-examples.

The following support materials can be found within the **Skill 8 pdf portfolio**.

8.02 Counter-examples printable worksheet.doc

8.03 Counter-examples answers.doc

8.04 Easy Peasy Socrateasy.doc

DEFINITIONS

We have seen how examples and counter examples can help us reach a sound definition of a concept. Another test of a definition is to look at its properties. For example, the properties of a cheese sandwich include: Bread, butter, Cheese.

We would be justified, then, in defining a cheese sandwich as 'something made up of bread, butter and cheese'.

Or would we? Is this *really* a good definition?

A cheese toasty is also made up of bread, butter and cheese.

Also, a cheese sandwich with no butter is still a cheese sandwich.

PROPERTIES

Two questions need to be asked:

1. Which of these three properties are essential properties of a cheese sandwich? mIn other words, what are the necessary conditions?

   Without the bread or the cheese, it could not be described as a cheese sandwich, so bread and cheese are necessary conditons of the definition

2. Are any of these properties on their own enough to be described as a cheese sandwich? In other words, what are sufficient conditions?

   None of the properties would be enough on their own, but we could say that the bread and cheese together are sufficient conditions of the definition.

This taboo activity will give you good practice at thinking of the properties of concepts. Make a list of all the properties that people use when playing the game, and then decide which of them are necessary and which of them, individually or jointly, are sufficient:

The following support materials can be found within the **Skill 8 pdf portfolio**.

8.05 Taboo cards.doc

This activity works best in groups, and will help you work out necessary and sufficient conditions of a definition.

8.06 There's something about Mary.doc

ANALOGIES

An analogy is a complex variety of comparison. A comparison is quite simple – it takes two things and suggests that they are similar in some way e.g. Life is like a box of chocolates, because you never know what you're going to get.

An analogy is more than just a comparison – it takes two situations that have something in common, and uses that to argue that what is true of one should also, therefore, be true of the other. Here is an example

Trying to live life without any rules is like trying to play football without rules. They would both lead to chaos and people will get hurt.

This is an analogy (not just a simple comparison between life and football). We can see that the two situations being compared are:

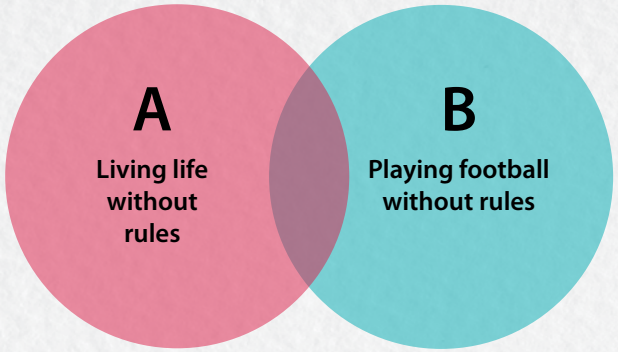
A . Living life without rules **B. Playing football without rules**

Because it is true to argue that B would lead to chaos/people getting hurt, the similarity between these two situations is being used to argue that A would also lead to chaos/people getting hurt.

Is this a good point?

It would only be a good analogy if the two situations are very similar. If there are more differences than similarities, or if the differences are more significant, then it would not work so well as an analogy.

A Venn Diagram is particularly useful in evaluating analogies:



The following support materials can be found within the **Skill 8 pdf portfolio**.

8.07 Evaluating analogies.ppt

8.08 Analogy Evaluation template.doc

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