**Paper Based Introduction to Concept Diagrams and Examples with Contradictions – 10 - 20 minutes approx.**

You will be introduced to concept diagrams via 10 examples first.

And then you will be presented with 3 examples which contain incorrect information, and explained how these contradictions are derived.

Now I will go over each example with you, feel free to interrupt me and ask if you are not clear with anything.

Through this study, a scenario of superheroes and their villains is applied to demonstrate the use of concept diagrams. Superheroes might consist of alien heroes, humans who have superpowers, gods, and so on. Villains may enemies of heroes, they may be equipped with high-tech devices, aliens with evil minds, and so on. Things might fight against each other. Heroes and villains could team up. There might be some bases/headquarters for heroes to use, e.g. dock, building and so on.

We use a rectangle to represent the universe, called Thing, which contains everything. We also use a curve to represent a set of objects, we could give a name for a curve, usually a noun. For example, (pointing at the sheet, PATS) a curve labelled with superhero means a set of superheroes, objects inside the curve might be vary, it could contain Batman, Ironman, Spiderman etc, but we don’t draw everything inside the curve, unless we want to emphasize some particular objects. Outside the curve but inside the rectangle, in the blank area, there might also be something. We give the name for the set of superheroes as Superhero, and Supervillain for the set of supervillains. We will come back to this diagram later.

This grey area says nothing is in that area. So this diagram tells us everything is a scenario, since there is nothing outside of Scenario.

And this diagram tells us all mad scientists are high-tech villains.

This diagram says no solo superpowers is a base, because there is no overlap between the two curves.

Two rectangles in separate places in fact refer to the same things. (PATS) although there are two rectangles inside one big rectangle, these three rectangles represent the same things. For example, there could be a set of supervillains inside the rectangle that contains superhero, but we don’t care about it for that rectangle, we want to emphasize that there is a superhero. Similar to the other two rectangles. In addition, we will see later, and I will explain in details when we meet them, but just keep it in mind for now, two curves or arrows with the same name are equivalent, regardless of their sizes or places.

Therefore this diagram tells us there are a set of superheroes and a set of supervillains.

In this diagram, everything that is a TempControl is also a HeatManipulation, meanwhile, everything that is a TempControl is also a ColdManipulation. Therefore, this diagram tells us all TempControls are heat and cold manipulations.

We also could have verbs (for something e.g. actions) between nouns. We use arrows to represent verbs. Note that these nouns or verbs are only names, it is not the case that a sentence only holds for a particular noun or verb. If we changed the names, but the curves, rectangles and arrows don’t change, remaining the same size, style and place, the sentence replaced by the new names are still true. For example, if we change the MadScientist into EvilMaster, the others stay the same, then it says all evil masters are high-tech villains. We can apply these nouns and verbs to anything.

Asterisks are used to represent sub-property information. This says for every individual, if it is related to something via takeBirdPower, then it is related to the same thing via hasFlyPower.

This diagram says InvisibleMan has power of only things that are invisibility. Things outside this unlabelled curve (PATS) but still inside invisibility might be something that is invisible, but not linked with InvisibleMan by the action hasPowerOf.

This diagram says only teleportation can move things. We don’t care what teleportation moves, it might be anything, but only teleportation moves.

This minus is related to the arrow direction, we say Teleportation moves, but the arrow points to the other side, so we use minus to mark it.

This diagram says solar energy is the source of at least one superpowers, something in the set of superpower. Again, there may be other Superpowers which solar energy is not the source of.

This diagram says things communicates with only plants. Again we don’t care what communicates with plants, but only plants can be communicated with.

This diagram says people helps exactly one instance of something. This curve is unlabelled, which means could be possible anything. This equal one is not fixed, could be eg. 2, which means people helps exactly two instances of something.

Do you have any question regarding these examples?

Now we move on to examples with contradictions. The left column shows 3 diagrams from which we can conclude there are contradictions. The right column gives explanations for each diagram correspondingly.

This diagram tells us: FishLike is equivalent to Anthro, BirdLike is equivalent to Anthro, and no FishLike is BirdLike. So we can make a conclusion, no Anthro is Anthro, if replacing FishLike by Anthro, and BirdLike by Anthro since two pairs are equivalent to each other. This is not true. There is a contradiction, therefore, nothing is an Anthro, nor FishLike, nor BirdLike. Although Anthro appears in separate places, they refer to the same thing, nothing is different between these two, everything inside this Anthro must be in this Anthro (PATS).

This diagram tells us: AnthroHawk copies only HawkEye, and AnthroHawk also copies some Speed. So there is an overlap between HawkEye and Speed. However, it also says no Speed is HawkEye. There is a contradiction. There is nothing that can be inside and outside the overlap at the same time. So there is nothing that AnthroHawk can copy. At least one of the following has to be true: nothing is an AnthroHawk, or nothing copies something.

This diagram tells us: an arbitrary thing wins some TwoStars, an arbitrary thing wins some FiveStars, no TwoStars is FiveStars, all TwoStars are Rank, and all FiveStars are Rank. So an arbitrary thing could win two different kinds of Rank, TwoStars and FiveStars. But an arbitrary thing wins only at most one Rank. Therefore, at least one of the following has to be true: nothing is a TwoStars, nothing is a FiveStars, or nothing wins something.

Do you have any question regarding these explanations of contradictions?

PC Note: say something about them having access to the results if they wish, and also to not discuss the study questions with anyone to help prevent any bias of results.