3-5: Getting to deeper levels of insight

So using metaphor, diagrams and visualization is a way to remember ideas better, sometimes you also wanted to get the deeper level of insight. So you don't wanted just have one understanding of an idea, you really understand how it works. And really understanding how it works can also be benefited by having a lot of this different metaphor and different access point. So one way that I strongly recommend if you don't just want to remember an idea but you need to deeply understand so particularly true of math, physics, computer science. Disciplines, where if you form the wrong way of understanding ideas, you create a metaphor or visualization that doesn't correspond of how the idea actually works, then you can answer questions or complex problems incorrectly because your metaphor is faulty. So one way of avoiding this problem and getting a really true representation of an idea as useful is what I called the compare and contrast method. So remember what I was discussing how to create the metaphor that you wanted to do is to create the deep structure of the idea, so as I was discussing the corno pricing model and compare that to an analogy which was kids playing with balloons. So you have in one hand on how the idea works and on the other hand how your metaphor works and you wanted to compare this deep structure.

So in compare and contrast method is you wanted to look for a– any places you wanted to can strengthen the metaphor, make it resemble the actual reality more. But more importantly you also wanted to pay close attention to areas where they do not correspond and any analogy will always have places where it doesn't fit. So the analogy will work for describing one feature of an idea but will it fail miserably for understanding another idea and this makes sense because the 2 situations are not identical so they will not going to have identical course, they're not going to have identical situation and so you might that happened. And so what important is not just to say that well I have to understand things just in the pure abstract sense it's useless to try to make metaphors and analogies. Because that's going to really lose a lot of benefit of the extra memory and ability you have to remember ideas better using metaphors. The way we use compare to contrast method is you notice where the ideas are similar but you also notice where the distance works. So you make a point of pointing out your head, ok well, as I was saying with the corno pricing model that one of the things that doesn't really matchup is that when the kids are trying to steal balloons and everybody have not divide them up equally then why would the other kids seeing this revert their contract and also try to steal the balloons which doesn't happen in the corno model but would happen in the playground example. That's the example were they differ, were they not the same

Another example is speedometer-odometer on a car. Well in an actual function on actual derivative we can go negative so we can have negative speed which reduces position

but speed and mileage in a car are monotonic so if you drive really fast in the opposite direction then your position can continue to increase your odometer continues to go up, it doesn't goes backward down to 0. So understanding these differences between these analogies actually allows me to understand the idea better and makes the metaphor lot more useful, so if I've just said, oh derivative is like a speedometer on a car then I've been missing this important point that can actually you can do negative and when it does go negative it can actually go rewind the odometer which has something that has never physically happens in the car. So this is something that is very important, comparing and contrasting is way of taking a fairly week metaphor and making it much, much stronger in giving you insight, not necessarily making it more vivid or more memorable but giving it more insight. This is also something to do with visualization, so as I said with visualization that imagines a computer function being likes a pencil sharpener. Now with the problem with the pencil sharpener analogy is often the input is actually distinct from the output. So it's the same pencil going in and being return with the, unsharpened pencil to sharpened pencil. But in the computer what you returning could actually be completely separate from the unsharpened pencil, so the unsharpened pencil still unsharpened, it just give you different sharpened pencil when you finished. So that's an example of the visualization context when I imagine the visualization of it, that maybe I wanted to change my visualization, maybe I don't want to stick my pencil and bringing out a pencil sharpener. Maybe I wanted to putting, touching unsharpened pencil and that just magically sharpened pencil comes out, unsharpened pencil magically sharpened pencil comes out. That's an example where I'm tricking the visualization so that incorporate these compare contrast details.

Another way you can get deeper level of insight is by just creating more metaphor more visualization. So no metaphor is going to be perfect, all of them will be going to have flaws and weaknesses and so one way you can really strengthen your understanding an idea is just to have lots of them. So if have a lots of different ideas, you can use compare and contrast better on each of them, you can really get a good coverage. So my corno model with the playground example might be good in some ways but might even bad in other ways. So I never really touch down the idea that price and quality and profit are all interrelated. That has nothing to do, I just use balloons as the examples and I'm not really exploring that structured of the idea. And so by creating completely different analogy maybe I could explore the price, quantity and profit relationship which is important on understanding that idea. So you create several metaphors, several analogies some kind of buffer around an idea, not only you create more association which again makes them an ideas easier to remember but you understand it is really multi fast and multi dimensional way, and by doing this, you will be able to use the idea in so many different context in really full of way as supposed to, oh my analogy breaks down in this particular problem, I'm done. You'll understand the very well representative way and would very hard for professors or

teachers to draw a problem that you won't be able to understand fully. So consider doing that as well, maybe just one visualization one diagram, and one metaphor, that's not would be enough, maybe you want to create a lot of them. And obviously time constraints are going to limiting you so you might not be able to make as many as you want. But going through this process is a very good investment of your studying time, so it's much better than just strictly reviewing ideas when you were reading a text book. So if you were going to do something like that just spent some time making metaphors, and just try to make as many as you can.

Another thing we can think about is also don't try to remember the metaphor or the visualization or the diagram, try to remember the idea itself. So this is a little bit of a distinction but what happens was some student is that they create metaphors and they spent a lot of time to memorize the metaphor. The whole point of the metaphors; the whole point of visualization is to make the underline idea easier to remember. I created tons of metaphors and visualizations I don't remember anymore but as long as I could remember what the idea was, then it doesn't matter. They're not there to be purposeful in of themselves. Once you planning in teaching a class and you wanted to reuse that metaphor for something, remember the metaphor isn't important, what is important is remembering the core idea. So consider it like scaffolding to form our house. You put in all these logs so you could build up the house but once you're done, you can remove the scaffolding because it's not important anymore, or if the scaffolding is taken down, the concrete form is still there because we are just using it to fill the concrete when it is still wet. Think of that as an analogy for this as well, that you can use your metaphor as the scaffolding but then if you forget them or to put or forget the place where to get them down, all that matters is that the house is there or that the building and foundation is there and its integrity.

So focus on that as well, don't try just to memorize all of your metaphors and try to use the metaphor to remember the core idea. So when you are testing yourself of whether you're learning the ideas better, don't try to see if you could just recall your metaphors, see if you could remember the core idea