Levels of *Processing* and *Learning* - a Primer

Learning and Instructional Scientists suggests that learners engage (think and process) about content during instruction at two main level, Surface level processing and Higher-level or deep processing.

At a **surface or low-level** processing the learning approach is focused on the substance of the content or subject matter. The energy of the learner is toward recall or memorization of the content. The learner's ultimate goal is to pass the test or avoid failure rather than grasp the key concepts. The types of strategies the learner uses are generally repetition-type practices.

At a **deep or higher-level** processing the learning approach is focused on the substance AND underlying meaning of the content or subject matter. The goal of the learner is deeper learning through a personal commitment to understand the content of study. This type of learning is associated with higher achievement and abilities to retain, integrate, and transfer knowledge of content at higher rates. The types of strategies the learner uses are generally reflection, relating information to larger patters, applying knowledge, integrating and synthesizing information with prior thinking, using thoughtful ways to think about new content, and viewing new content from different perspectives.

Surface level of thinking is equated at Bloom's **lower order thinking** skills like *remembering* and *understanding*. Instructional strategies that support surface learning include those that support memorizing, rehearsing, listing, etc.

**Deeper level** thinking is equated with Blooms's **higher order thinking** skills like *applying*, *analyzing*, *evaluating*, and *creating*. Instructional strategies that support deep learning include those activities like demonstrating, comparing and contracting, defending, judging, formulating, role playing, problem-solving.

Let's look at a model of how surface and deep learning differ from the knowledge perspective…
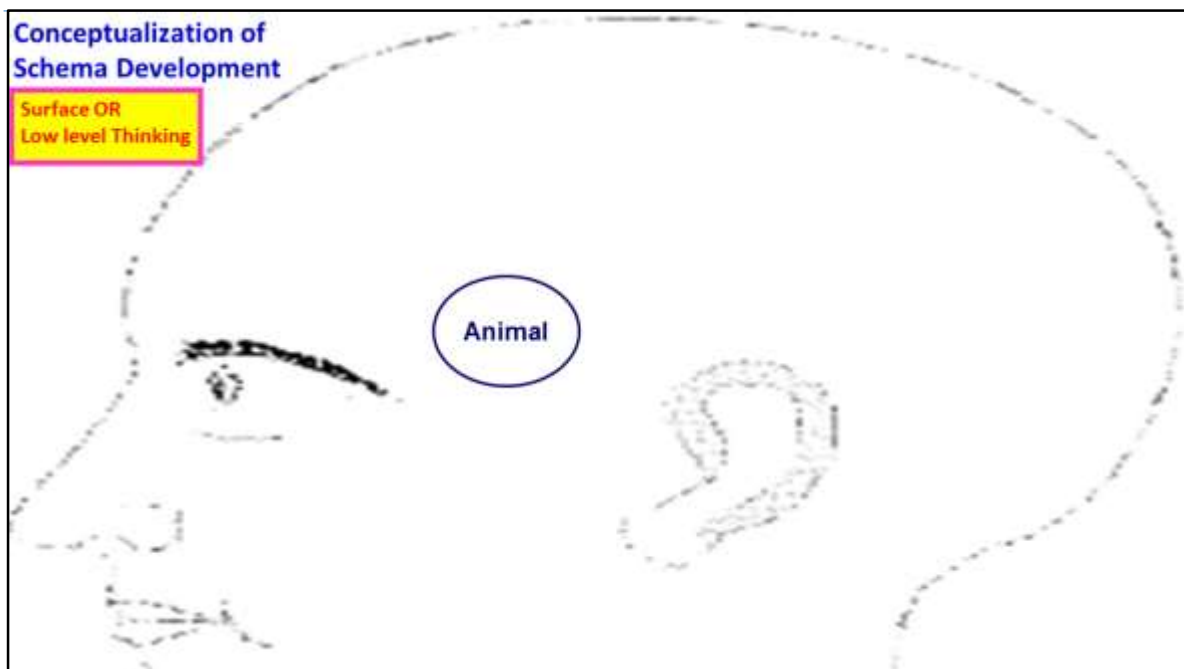
This model is based on a conceptualization of schema development. Schema development suggests that learning is a process of creating and connecting concept (information) in the brain. Very simply put, the more concepts or nodes that the learner has in his or her brain and the more connected these nodes, the more that knowledge he or she has about the content area. A series of a few nodes with few connections is surface level … and series of a few nodes with many connections or a lot of nodes with many connections indicates higher levels of processing and deeper knowledge of the content area. Processing new information results in the development of new nodes and/or new connections making the schema more complex.

Let's look at the concept of animal. It is represented by the circle or node with the word animal… the learner has just been introduced to this content so begins with a simple node… recalling this node is surface or low level thinking.

Conceptualization of Schema Development

Surface OR Low level Thinking
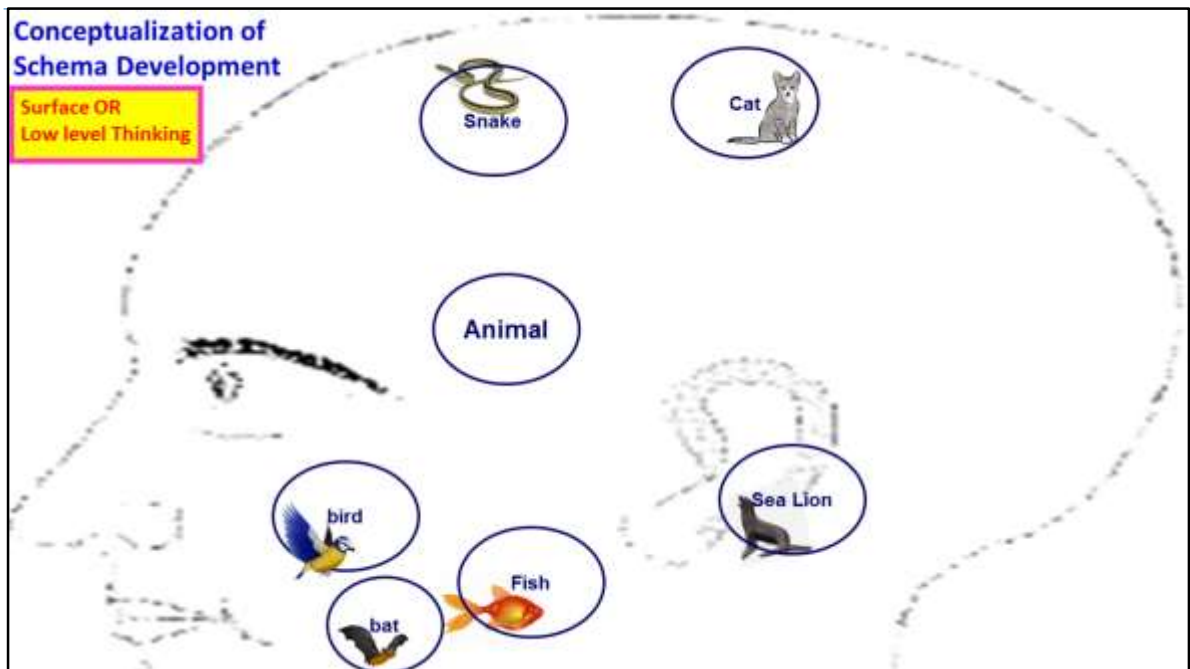
When the learner is introduced to several types of animal… snake, cat bird, bat, fish, sea lion… and able to recall them, the nodes are added to the schema..

Conceptualization of Schema Development

Surface OR Low level Thinking
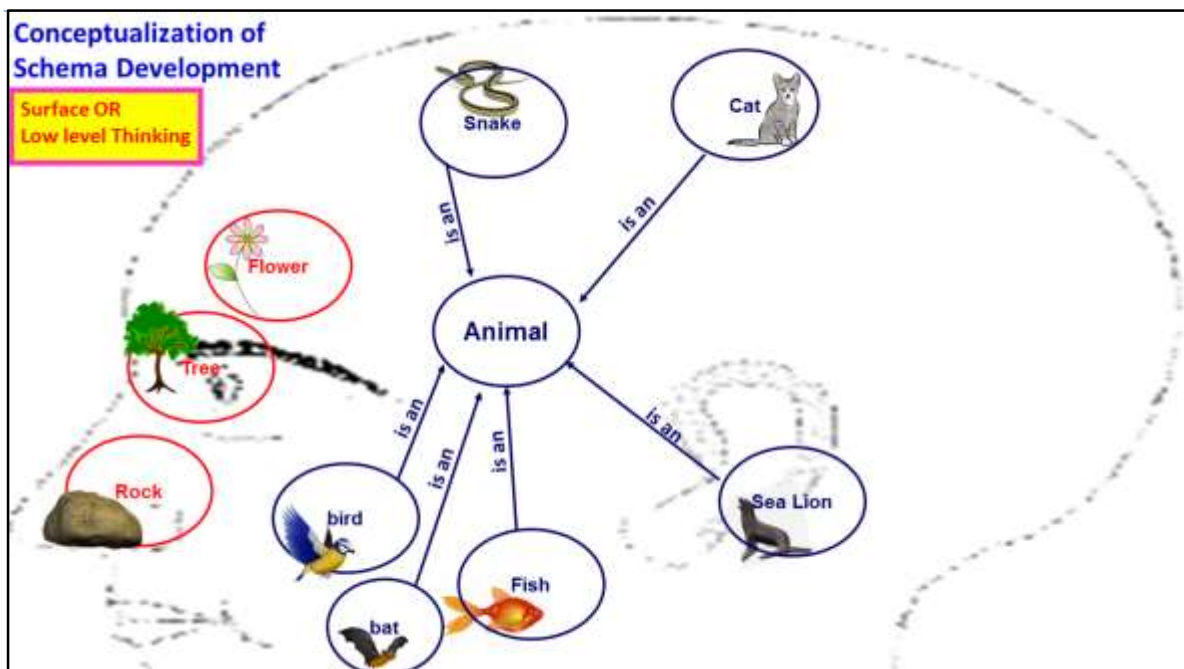
The learner learns that these are all examples of animals thus makes connections between each and the node animal… for example a snake is an animal, and sea lion is an animal. These are surface or low level thinking connections.

The learner may also be introduced to none-animal things… like flower, tree, and rock.

Conceptualization of Schema Development

Surface OR Low level Thinking
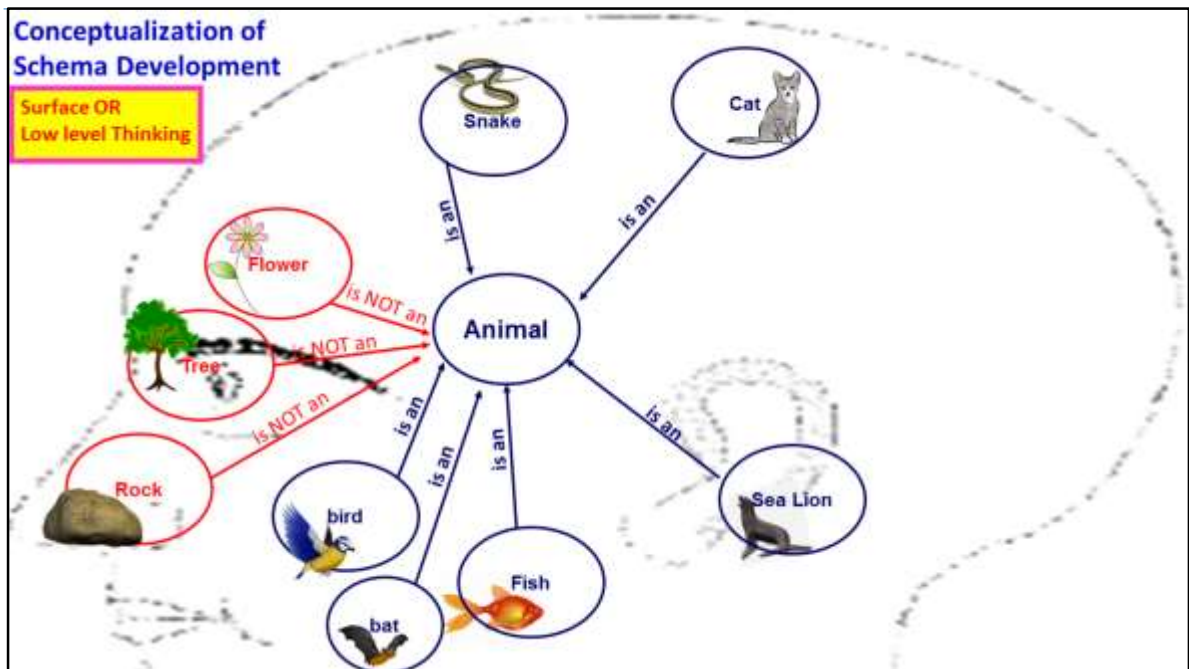
He or she will learn the connection to animal is 'not an animal.. So the schema connections are flower is not an animal, tree is not an animal, and rock is not an animal.

These are still surface or low level thinking as the learner is merely able to recall concepts at a simple level .. They are or are not animals…

Conceptualization of Schema Development

Deep OR High level Thinking
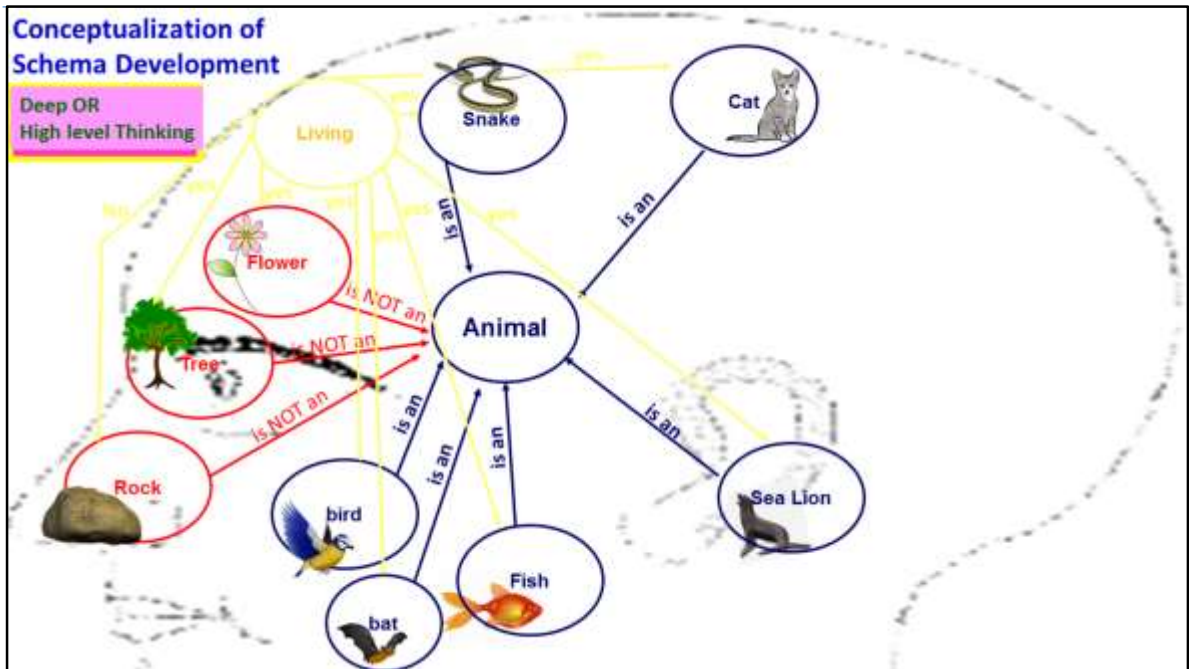
As the learner is introduced to additional information about animals.. They are living things and new node is added – living … and the learner can then begin to develop a slightly deeper understanding of the concept of animals by classifying them as also living creatures… so a cat is living and it is an animal… when it comes to the 'not an animal' nodes the learner can also classify those nodes as living – the flower and the tree and as non-living the rock.

The understanding of the characteristics of animal is now getting more complex as new concepts – living or non-living – are added to the schema or group of nodes.
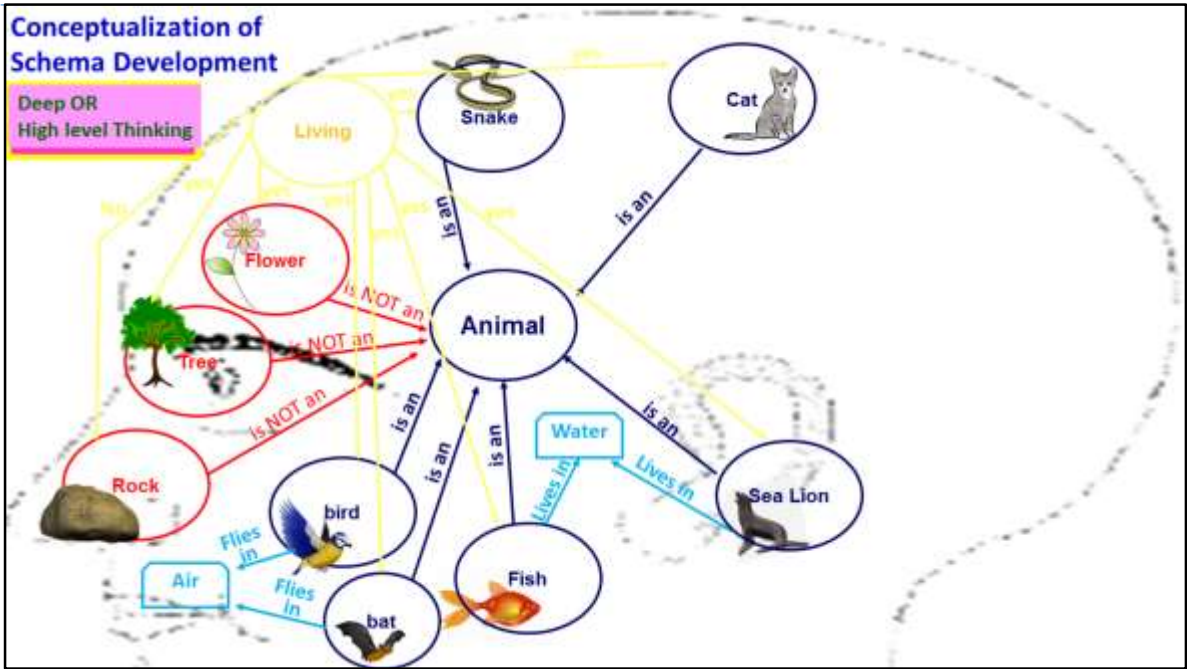
The deep or high level of thinking continues as the learner engages in thinking and processing more information about the nodes.. In this case the learner is developing further connections about the characteristics of some of the animals. For example both birds and bats fly in the air… and both fish and sea lions live in the water… more nodes and connections indicate more depth of knowledge…
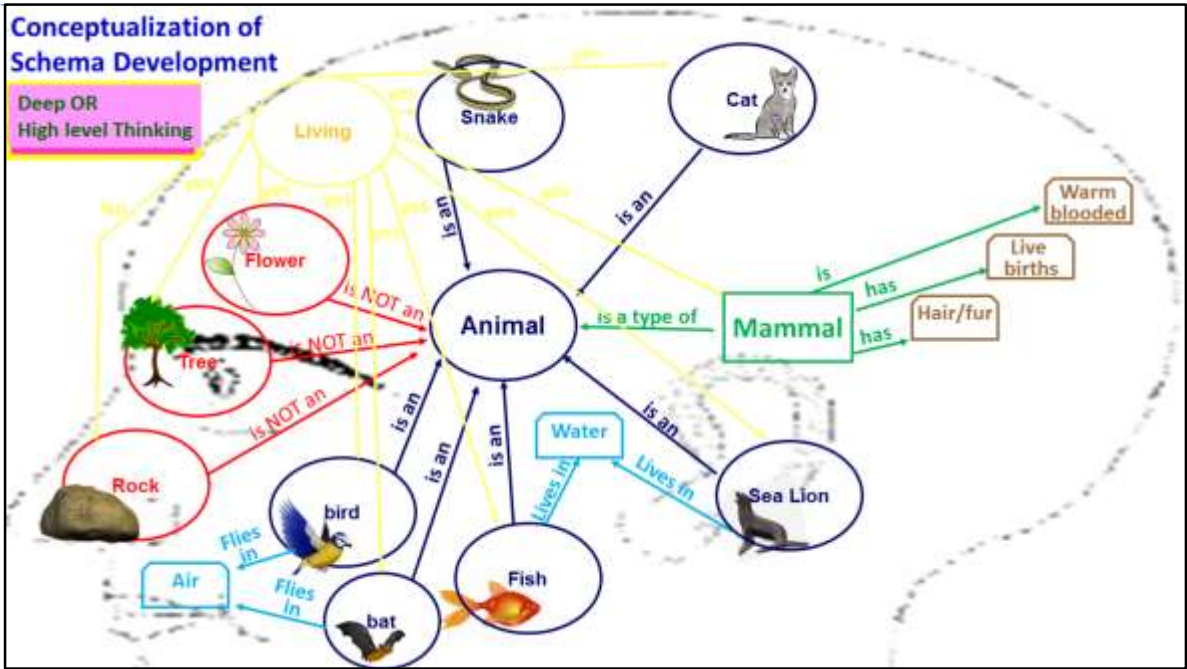
As another node is added – mammals, the learner learns that mammal have certain characteristics… it is a type of animal and it is warm-blooded, has live births, and has hair or fur..

Conceptualization of Schema Development
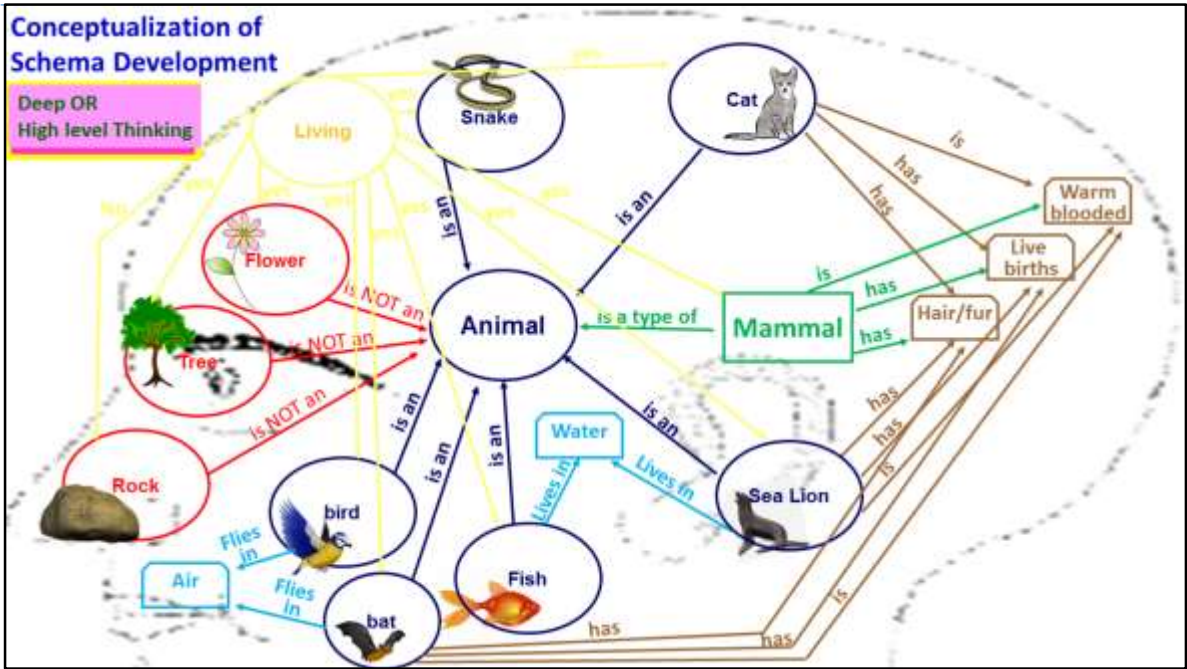
The learner then evaluates each animal within his or her schema to determine if it has these characteristics…

Conceptualization of Schema Development
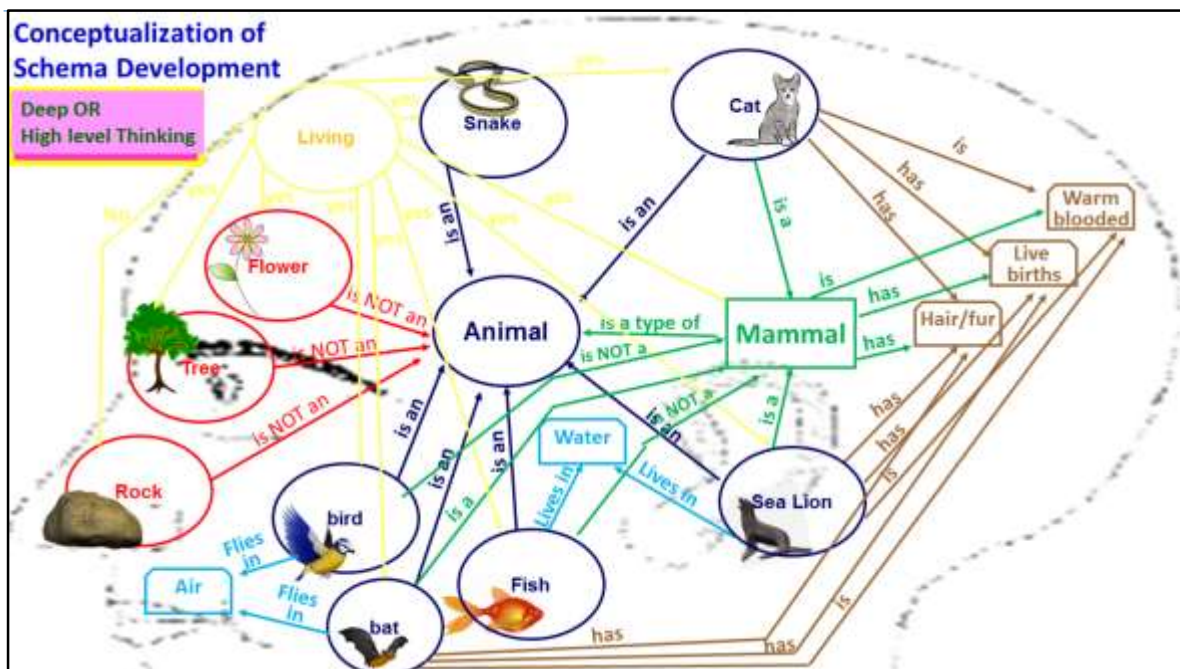
Since the cat, bat, and sea lion have all of the characteristics of a mammal they are all now connected to the mammal node…

The bird and fish do not have these characteristics so are connected as "is NOT a" Mammal.

The number of nodes about animals continues to grow as does the number and type of connections about each node and the new nodes… it is thought that the more nodes, the more information the learner has about the content.. And the more connections, the deeper the learner understanding and is able to use the content…

In summary, learners learn or develop knowledge in the form of schema at either a surface-level or deep-level. Learning is directly related to the purpose and effort learners expend on the content or new information presented…

Surface level learning results in fewer cognitive connection and a simpler level of learning… recall or list facts

Higher level learning results in more nodes and richer cognitive connections and a more complex or deeper level of learning … learners are able to apply, integrate, synthesize, and process and use know knowledge in multiple ways. Facilitating learners during instructional activities to work with and think about new content in multiple perspectives .. In generative (hands-on, mind-on), flexible, reflective, and higher order thinking ways can help facilitate develop richer schema that indicate deeper knowledge development.