CONCEPT ATTAINMENT

Concept attainment is an instructional strategy that uses a structured inquiry process. The strategy is based on the research of Jerome Bruner (1977) and his associates, who investigated how different variables affected the concept-learning process. In concept attainment, students figure out the attributes of a group or category that has been provided by the teacher. To do so, students compare and contrast examples that contain the attributes of the concept with examples that do not contain those attributes. By observing these examples, students discuss and identify the attributes of each until they develop a tentative hypothesis (definition) about the concept. Next, students separate the examples into two groups, those that have the attribute and those that don't. This hypothesis is then tested by applying it to other examples of the concept. Examples could be symbols, words, passages, pictures, or objects. This strategy can be used in all curriculum areas. Finally, students demonstrate that they have attained the concept by generating their own examples and nonexamples. Concept attainment, then, is the search for and identification of attributes that can be used to distinguish examples of a given group or category from nonexamples. With carefully chosen examples, it is possible to use concept attainment to teach almost any concept in all subjects.

To illustrate the concept attainment process, consider the concept *proper noun.*

- First, the teacher chooses the concept to be developed (i.e., proper noun).
- Begin by making a list of both positive "yes" and negative "no" examples: The examples can be put on sheets of paper or flash cards or written on the chalkboard.
- *Positive examples:* Positive examples contain attributes of the concept to be taught (e.g., Jane, Houston, John, Settle, United States, George Washington, Honda, Old Testament). Your list of examples should include the idea that a proper noun means a specific person, place, or thing.
- *Negative examples:* Next present negative examples of the concept (i.e., run, is, and, boy, heavy, slowly, town, chair). Note the negative examples differentiate *proper nouns* from *common nouns.*
- Designate one area of the chalkboard for positive examples and one area for negative examples. A chart could be set up at the front of the room with two columns—one marked YES and the other marked NO.
- Present the first card by saying, "This is a YES." Place it under the appropriate column (e.g., Settle is a YES).
- Present the next card and say, "This is a NO." Place it under the NO column (e.g., run is a NO).
- Repeat this process until there are three examples under each column.

- Ask the class to look at the three examples under the YES column and discuss how they are alike. Ask, "What do they have in common?"

- For the next three examples under each column, ask the students to decide if the examples go under YES or NO.

- At this point, there are six examples under each column. Students should begin to hypothesize a name for the concept. These hypotheses are tested with further examples and nonexamples provided by the teacher. Students determine which hypotheses are acceptable and which ones have to be rejected based on the examples. They also can suggest additional hypotheses at this point. The process of presenting examples, analyzing hypotheses, presenting additional examples, and continuing to analyze hypotheses continues until all the hypotheses but one are eliminated.

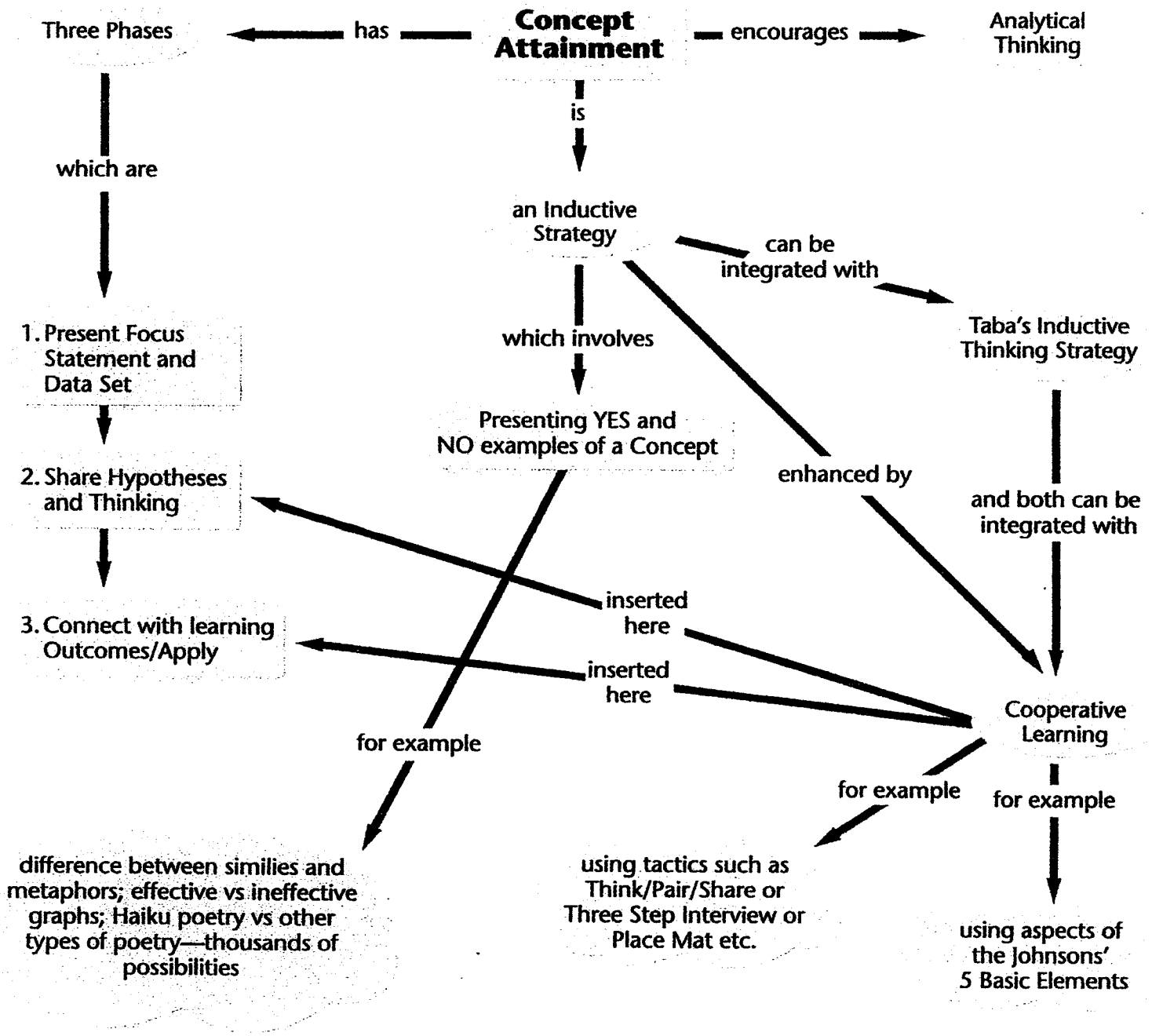
- Discuss the process with the class. Students should be asked to explicitly define the hypothesis and identify the characteristics. Students are then asked to define a proper noun.

- Next, students are asked to apply the concept by classifying examples or generating examples of their own.

- Students analyze their own thinking (metacognition). Ask questions such as, "Did anyone have to change his or her thinking?" or "What made you change your mind?" or "When did you begin to see this concept?"

The concept attainment strategy is based on the assumption that one of the best ways to learn a concept is by seeing examples of it. Because examples are central to the concept attainment activity, special attention must be paid to their selection and sequencing.

Concept Attainment



Note: see *Models of Teaching* by Joyce and Weil for more information on this model of teaching

An Explanation of Concept Attainment

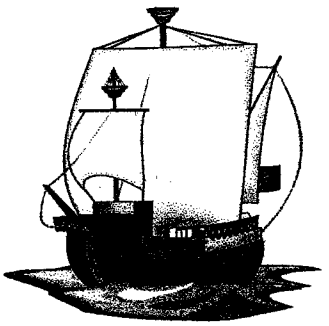
What is it? Concept Attainment is an inductive process that helps bring meaning to concepts or helps construct concepts through the searching for common characteristics (called attributes). In Concept Attainment, the student compares like examples and contrasts them with unlike examples.

Those characteristics can be applied to distinguish examples of a concept from non-examples of that concept. For example, to distinguish "metaphor" from other literary techniques such as simile, hyperbole, oxymoron, etc.

Why use it: One role the teacher plays is to engage students in thinking related to concepts; to help them meaningfully grasp the design of a concept; to own it; to think and be creative with it. The reason for this is that our understanding of concepts is how we represent what we know; it brings meaning to facts, principles, systems, theorems, etc.

You could argue that for every concept the students do not understand, the less likely they are to understand the meaning of the fact, or principle, or whatever. Obviously some concepts are more important or more complex than others. The teacher's role is to decide what concepts need to be understood in order to bring clarity to thinking. So, the science of teaching is, in part, represented by the instructional strategy of Concept Attainment; the art is represented, in part, by the decisions of when to employ it given the nature of the learner.

David Perkins's (1986) work on **Knowledge as Design** vs. **Knowledge as Information** connects to the thinking process involved in Concept Attainment. He states that when students are learning concepts, they should be able to respond to four questions related to the design of that concept. This pushes the idea of actively constructing knowledge rather than passively absorbing it.



Take something as simple as this widely accepted *fact,* *"Christopher Columbus sailed the ocean blue in 1492."*

Embedded in that fact are the concepts of:

- explorer
- sailed
- colour – blue
- ocean
- A.D. – year

David Perkins' work on Knowledge as Design

4 Questions

1. What are the critical attributes of the concept?
2. What are the purposes of the concept?
3. What are model cases of the concept?
4. What are the arguments for learning the concept?

For example, we can explore the design of the concept "Screwdriver" using Perkins' 4 questions:

1. Attributes	it has a handle, a shaft and an end that fits into a screw
2. Purpose	it is designed to put in screws
3. Model cases	flat head, Robertson, Phillips
4. Argument	it gives us mechanical advantage

What would you do with: Democracy, Love, Rich, Smart?

You start to see the design complexity. Unless you can identify the critical attributes, and create model cases (examples) you cannot construct the data set for Concept Attainment. For example, as we worked with several high school science teachers we got stuck on designing a lesson on "Synthetic." When we got to glass, we could not decide whether glass was synthetic or not. Then we realized we were not sure what "synthetic" really meant—we had examples, but we quickly realized how much about the "design" of synthetic and of glass we did not know.

Concepts not invented by humans do not follow this same process—volcanoes, thunder, etc. What is their purpose, what are the arguments for their value? They have a design, but it is different. Perkins discusses that difference in his book titled, *Knowledge as Design* (1986).

Oh, just a simple question for you. What is a concept?

At the simplest level – everything you can put a label on is a concept or an example of a concept. Look around you. Everything you can see, feel, touch, smell—in any sense—is a concept: Love, rough, ring, deep, aunt, clear, pain, sun, bright... everything.

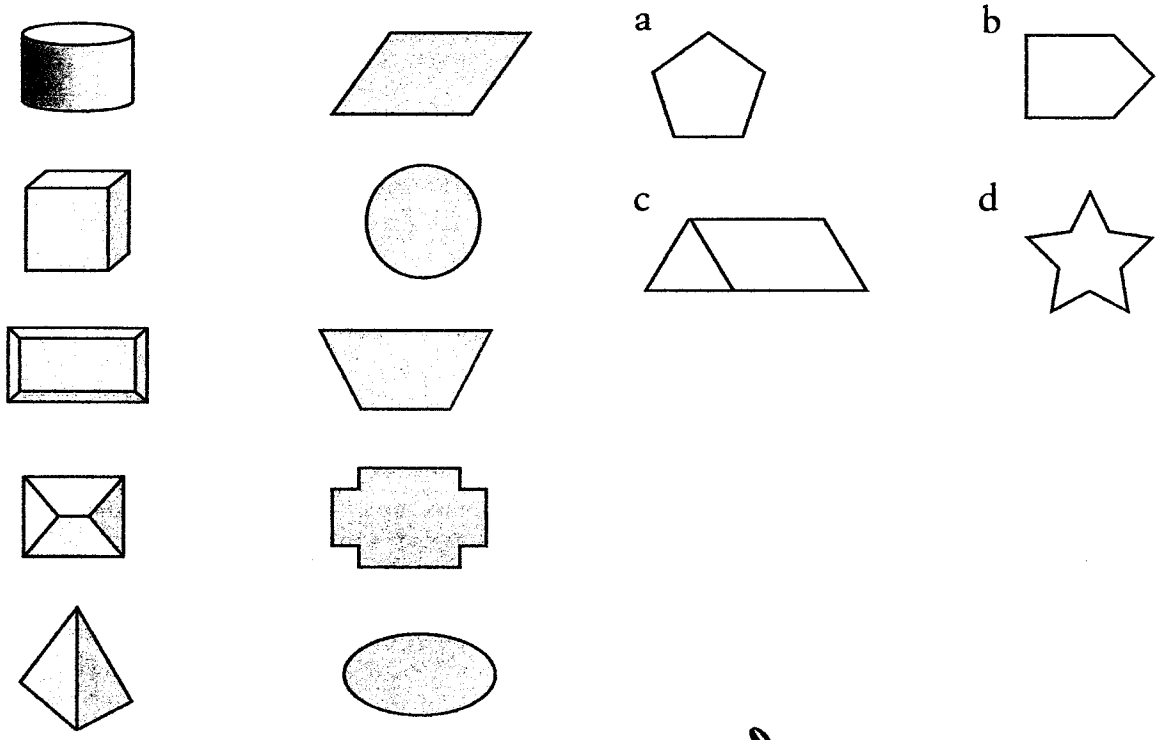
Key Things to Remember about Concept Attainment

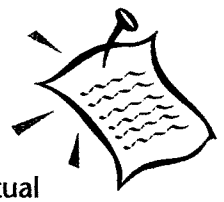
- it is an inductive strategy—rather than telling students it encourages students to find out what things have in common for themselves; the pay off is that students remember
- identify what you think are the key concepts in a unit of study and decide whether or not Concept Attainment would be the best process for the students to gain understanding
- it involves presenting examples and non-examples of a concept—and when the students appear to be getting the idea—then you present them with testers to check their understanding
- start with a few fun/easy data sets first so that students get the idea of the process
- everything that you can see, touch, feel, taste, smell, hear, describe, or label is an example of a concept (except when there is only ONE of something (e.g., Toronto is not a concept—it is however an example of the concept "city")
- remember, you can always do a mini-lecture to clarify or extend their thinking if they get stuck
- when showing examples, you should be prepared to share at least ten YES and NO examples—plus three or more testers; the more complex the concept for the learner, the more examples you should be prepared to share
- the focus statement is important in assisting students to more clearly analyze the data set—the more you tell them, the easier it is for them to form hypotheses, but the less likely it is that their "brains" work at finding the pattern—the art is learning to provide the most appropriate focus statement—this only comes with practice
- given talk is critical for intellectual growth, then using cooperative group structures like Think/Pair/Share in Phase Two is wise

Data Set: Example One - Geometry

Rather than providing students with information regarding 3 Dimensional Shapes, create a data set to let the students' brains look for the pattern and to discuss with one another what they think. You can do this with Kindergarten students and use triangles on one side and other shapes on the other. Perhaps place the examples and non examples in two Hoola Hoops and for testers, give the students a shape and have them discuss where they would put it and why. "In the data set below, what do the shapes on the left have in common? How are they different from the shapes on the right? Think to yourself, then share with a partner. When you think you both have an idea, take turns discussing where you would put the Testers."

LEFT **RIGHT** **TESTERS**





Note that you can use chart paper, overhead Transparencies, or the actual shapes as a means of presenting the exemplars. Or you can modify the data set to use shapes in the room. For example, the concept of parallel works well using objects in the room: Show students yes and no examples of edges that are parallel and not parallel.

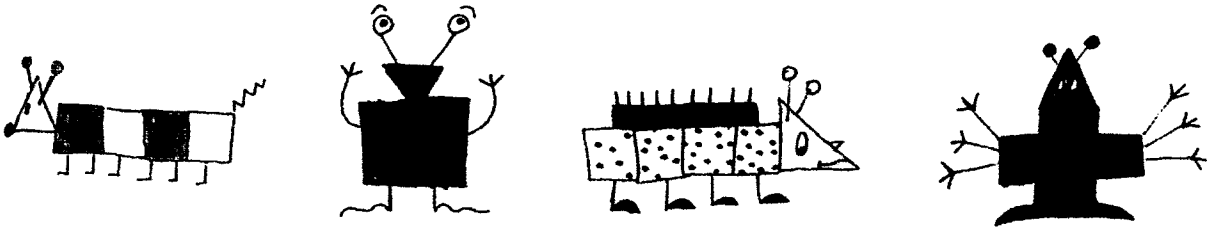
Data Set: Example Two - Cartoon Characters

This is a sample data set used to provide students with practice hunting for attributes—they find it fun. Easy for non-readers and readers alike. Such examples can be provided at different levels of complexity.

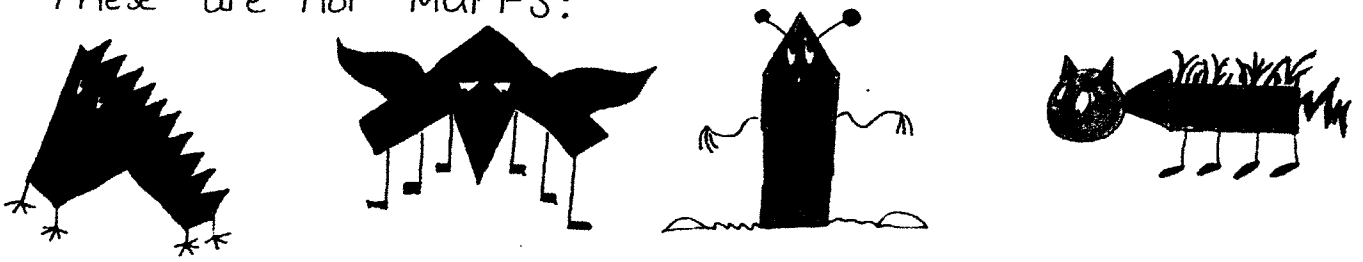
MUFFS

Look at these MUFFS:

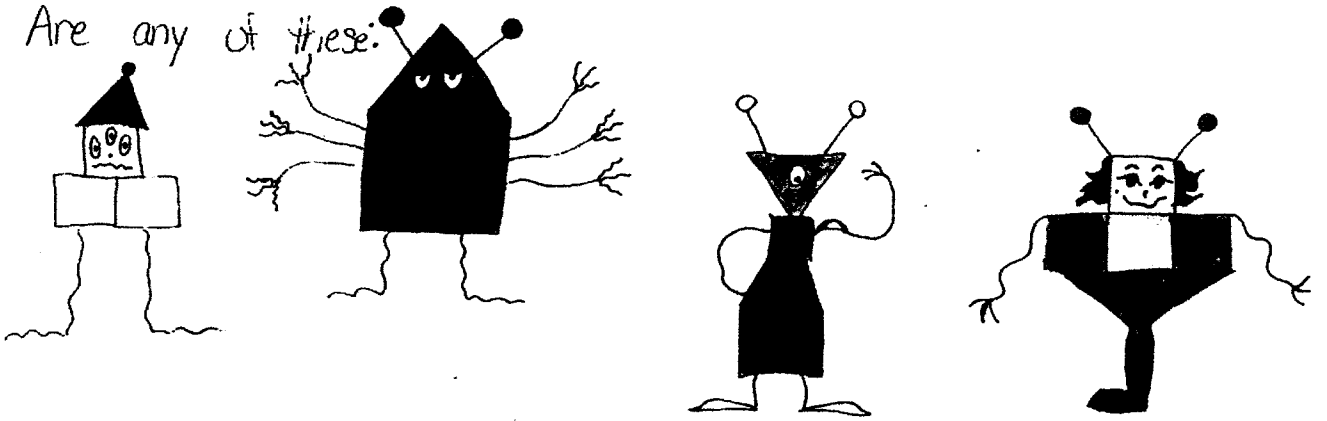
Stacy Wagstaff



These are not MUFFS:



Are any of these:

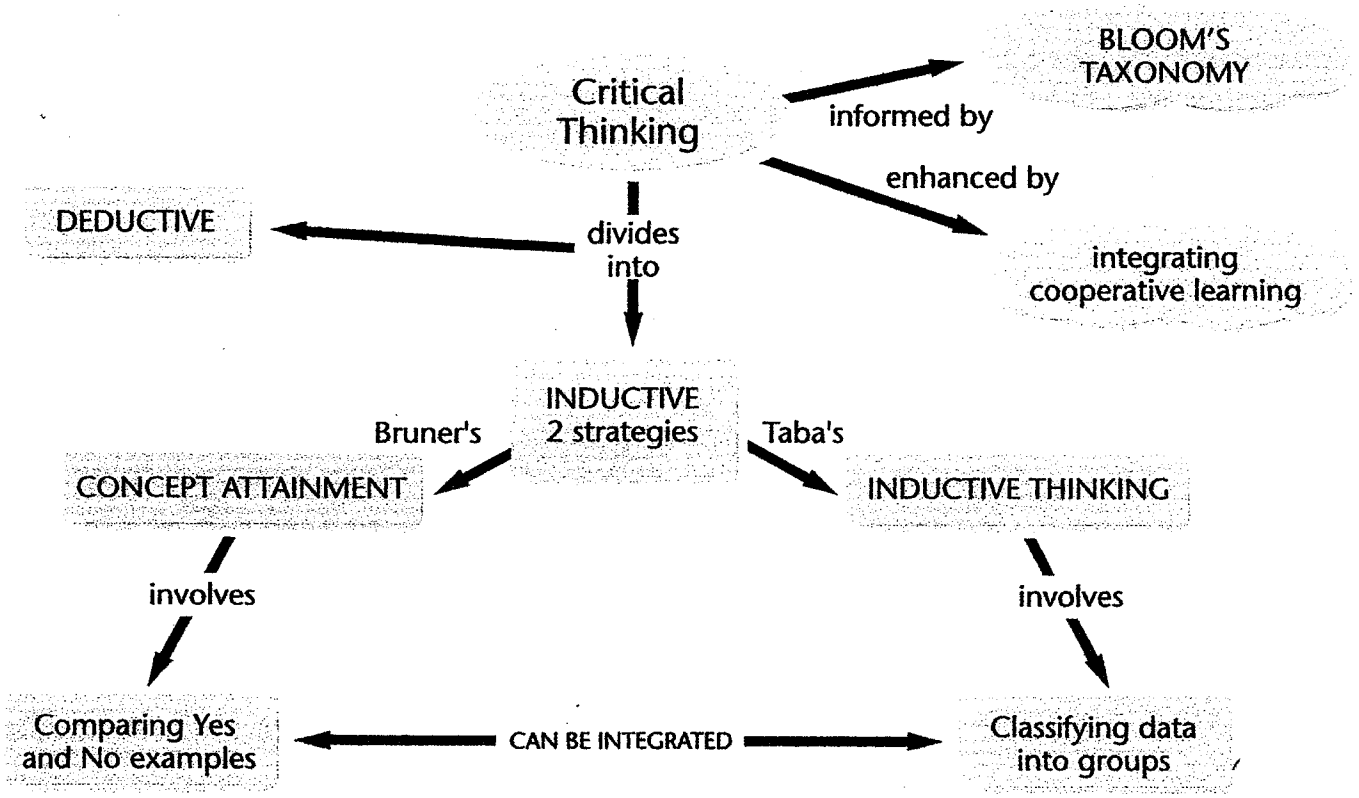


Can you and your partner create a MUFF?

What is Inductive Thinking?

Thinking can be classified into a variety of types: creative thinking, critical thinking, divergent thinking, convergent thinking, etc. The classification that Concept Attainment fits most logically into is Critical Thinking. In most critical thinking texts, critical thinking is divided into Deductive and Inductive thinking. With deductive, we often think of science or of detective work (e.g., trying to find a cure for a disease or the person who stole the jewelry). With inductive, we can also think of science and detective work (e.g., trying to classify insects into groups based on common characteristics or looking for a pattern in a series of robberies to predict where they might hit next).

Concept Attainment is an inductive strategy that encourages students to look for patterns, to hunt for characteristics. The brain research tells us the brain enjoys searching for patterns. In the next chapter we introduce another inductive strategy called "Inductive Thinking." The difference between the two is that in Concept Attainment the teacher provides the group of ideas already classified—the students simply have to study what the group of ideas have in common and tease out the characteristics.



Final Thoughts

Concept Attainment

It is at heart a game ... a detective game. The clues are presented and the observers have to hunt down the pattern. The process is enhanced when the detectives can discuss their thinking.

In a grade one class that had played with this strategy during kindergarten and now into grade one, they would not give up and after the 23 pairs of examples, produced the key characteristics for "biotic" and "abiotic." The data set began with five flowers and five things that were not biotic (rocks, windows, etc.). This then shifted to trees, which caught them a bit off guard for a few seconds. Finally after about 10 plants, the shift was made to animals and then humans. After about the thirteenth example, they all knew where the testers fit, but they could not say why. By the twenty-third pair of examples, they had it. Interestingly, the teacher had put basketball and car on the abiotic side, and one girl reminded him that basketballs are made of rubber and that rubber comes from trees and that the teacher needed to change it. A boy told the teacher that he should put car in the middle (the students used Venn diagrams to conceptualize how to group data). The reason is that the tires are rubber and the seats might be leather.

You have to remember that the students must be able to see all the characteristics of the concept in each example. That is why concepts such as "warm blooded animals" and "mammals" are difficult; the students cannot sense the attributes. For example, if you were doing "cold and warm blooded animals" and you had the animals in your classroom, you could pass them around the room ... telling them that the snake and alligator represent the concept; the elephant and horse do not. The same thing applies with the concept of flightless birds. You would have to have them on the roof of the school and toss them up in the air. Of course the penguins and ostriches may not enjoy the process (and you may end up in jail).

With younger students we have seen Concept Attainment Centres set up in the classroom. An example is the GUESS MY RULE centre. The centre has a lot of junk and a table with a piece of tape down the middle. The students create data sets and then invite other students to come and guess their rule. It could be "shiny" or "rough" or "colour red" or "triangles" or words or things that start with 'T' or pictures of winter and not winter, etc. They enjoy it.

In all of this, though, it is important to have the students discuss their hypotheses and to share their thinking about how they got to where they are regarding their thinking. Thinking about thinking and sensing how we all think differently is not just interesting; more importantly, it is part of being a fair minded and reasonable critical thinker.