Card...from page 9

would generate examples (better known as prototypes) and non-examples of these angles which students could look at over and over until they "discovered" the concepts and delineated their properties. My first procedure was called RANG, which arbitrarily placed right angles on different places on the page. It was important that the angles be oriented in different directions, and had sides of random length to prevent students from locking on to incorrect properties. For example, many students form the impression that a right angle always sticks straight up and to the right, hence the name "right angle". This misconception follows students through high school and often hinders their ability to "catch on" to geometry and trigonometry.

RANG gives students prototypes of right angles, but equally important is a second procedure called NOT.RANG which calls up acute, obtuse, and straight angles. Again, it randomly generates angles of differing orientation, sizes and lengths on different sections of the screen.

The beauty of a dynamic concept card is that it allows students to call up numerous representations of a concept, determine its key properties, and test their deductions about those properties. A correct deduction can be supported by ordering up a dozen more "rangs" or searching for the absence of that property in "not.rangs." At the lowest level of understanding (van Hiele labeled it level 0), a child will simply state that an angle is a rang because it looks like a rang. However, a child who has a higher level of understanding is able to describe its properties (level 1) and use those properties to make certain deductions and conclusions (level 2.) When this activity was completed, for example, students gave the following descriptions of a rang.

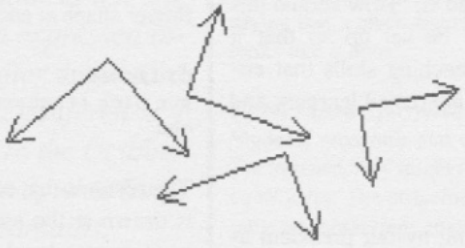
They make a corner of a square.
Two lines put together at a 90 degree angle.
Arrows joined together by lines. Also the line are slanted straight and diagonal. A right angle.
A 90 degree angle. You can draw a perfect square inside of it.

A rang has the same distance between the two arrows, or in other words, a 1/4 of a square.

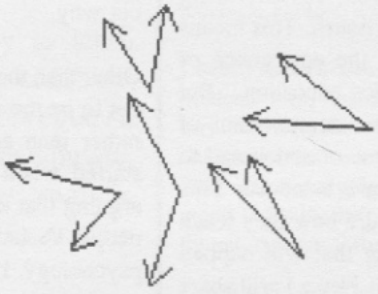
These same kinds of descriptions emerged for acute angles (two arrows whose stems are very close together) and obtuse angles (can't be a rang because the stems are farther apart.)

In addition to geometry, concept cards can be used in mathematics, social studies, science, and as my example shows, language arts. (Figured it out yet? Here are some more virblets: communicate, Mississippi, and zoo.)

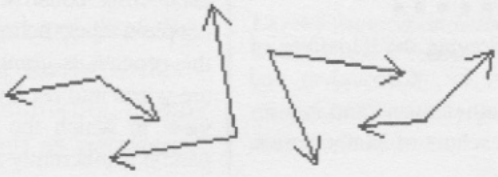
These are Rangs:



These are <u>not</u> Rangs:



Pick out the Rangs:



One might wonder why I used the term RANG instead of RIGHT.ANGLE as the name of my procedure. (I also called acute angles "cuties" and obtuse angles "obs.") As teachers we have to remember that many students bring with them misconceptions about many things they have encountered in the past. A child who has been taught the textbook model of a right angle might be resistant to the idea that a right angle could face downwards or left, or might have two sides which are uneven. By using a nonsense word, these misconceptions would not prejudice a child towards a certain model, and would free him/her to look for those all important key properties.

You can also have children make up concept cards of their own, and perhaps even make them "dynamic." My students have grown to love them, and as I have incorporated them into my science classes, students don't regard them as lessons. They're just plain "fun."