

proven effective for helping students focus their attention on specific text information.

Automatization of other basic skills besides reading (such as the rules of arithmetic operations and grammar) is considered to be a desirable educational goal for the primary grades (Gagné, 1983; Bloom, 1986). By extension, one can also see the usefulness of learning certain tasks as adults to automaticity. Pilots must react automatically to a variety of information sources in the cockpit. Astronomers automatically process patterns of stars in the search for anomalies that might be signs of new stars or other astral phenomena. And detection of signs of abuse is probably automatic for skilled therapists.

### Pattern Recognition and Perception

Just attending to information is not enough to ensure its further processing, however. One might say that attention is necessary but not sufficient; information must also be analyzed and familiar patterns identified to provide a basis for further processing. **Pattern recognition** refers to the process whereby *environmental stimuli are recognized as exemplars of concepts and principles already in memory*. This recognition is preconceptual, something like finding a shape that matches a stencil without identifying what the shape or stencil pattern actually represents.

Pattern recognition is a particularly difficult process to model in the human information-processing system, and, consequently, several different models have been proposed. Each carries particular implications for how the process operates and for what form information is represented in memory. Briefly, template matching assumes that mental copies of environmental stimuli, or templates, are stored in memory. Pattern recognition, then, consists of simply matching the incoming information to the appropriate template in memory. Although this seems intuitively appealing, look at Figure 3.3 and consider what this means for a template-matching model of pattern recognition. In order for you to recognize all of those figures as representations of the letter *A*, you would have to have templates in memory to match each one. For obvious reasons, this model fails as a reasonable account of human pattern recognition.

According to an alternative, prototype model, what is stored in memory is not an exact copy of a stimulus, but rather an abstracted, general



FIGURE 3.3 Variations of the Letter *A*

prototype. Pattern recognition information with the prototype coming stimulus is recognized represented by the prototype. ple, are similar enough to the

The prototype model has been used to explain pattern recognition, primarily because of its ability to account for the recognition of atypical concepts in memory (Smith and Shiffrin, 1975). For example, asked to identify the verbal stimulus *red*, you might think of the word *engine red*. Similarly, reading the word *red* might evoke general ideas about the word *red* that are not countered examples.

A third model of pattern recognition is the feature analysis model. That specific, distinctive features of a pattern are analyzed. A one more time, its defining features are analyzed at which they are joined, and the features would be analyzed for the pattern as *As*.

Feature analysis, like the template model, uses the available evidence and together, the two models provide recommendations for concept learning. Smith and Shiffrin proposed a model for teaching a concept. A prototype or prototypic concept exemplar is stored in memory. From the prototype in system memory, the meaningful dimensions that are critical and invariant across examples.

To see how this model works, consider the example from the previous chapter: positive reinforcement. One might be one in which positive reinforcement is used in the use of a primary reinforcement schedule. Consider the use of a primary reinforcement schedule in school or adults at work and in the home. Consider how a medical student might learn to identify normal cells. With stained slides, the student could compare the normal cells with the range of what is considered normal. The student could identify the cells as diseased.

Although the feature analysis model is a good model for most instances of pattern recognition, it does not explain why certain patterns are recognized.