# Cognitive Styles and Strategies
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Cognitive strategies are defined as the "internal processes by which learners select and modify their ways of attending, learning, remembering and thinking." (Gagne, Brigg, and Wagner, 1988, p. 67) In other words, cognitive strategies enable us to organize and understand information in different, often powerful, ways. West, Farmer and Wolff (1991) identified four different categories of these mental processes: chunking, spatial, bridging, and multipurpose. Knowing more about these strategies may suggest different ways for you to organize your own learning.

**Spatial Learning Strategies** are a group of learning, or cognitive strategies, which help the learner organize information visually. The two major types of spatial strategies are *frames* and *concept maps*. Table 1 provides an overview of these learning strategies.
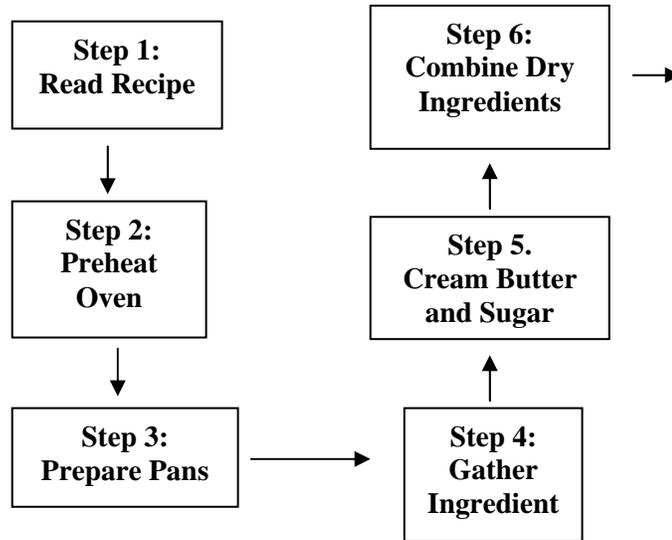
### Table 1.
### Spatial Strategies

| Type of Strategy | Purpose | Examples |
| --- | --- | --- |
| Frames | Provide visual organizational structure | Tables |
| Concept Mapping | Displays concepts and relationships | Chain, Hierarchical, Spider |

**Frames** show the organizational structure and provide the learner with an understanding of the "big picture" or overall schema of a particular theme or topic area. Frames are useful for "demystifying" a topic area by allowing learners access to the larger themes, thereby facilitating the metacognition described by Ausubel and other cognitive psychologists. According to Ausubel, "metacognition" is the process of active reflection on learning. In other words, it is "thinking about thinking." This process allows powerful "deep learning" to occur, as opposed to "surface learning. This table is an example of a simple frame.

**Concept Maps are** very good strategies to use when it is important to show relationships among different ideas.

**Figure 1.**
**Sample Chain Map**

```
┌─────────────┐              ┌──────────────┐
│   Step 1:   │              │   Step 6:    │
│ Read Recipe │              │ Combine Dry  │ ───→
│             │              │ Ingredients  │
└──────┬──────┘              └──────▲───────┘
       │                            │
       ▼                            │
┌─────────────┐              ┌──────────────┐
│   Step 2:   │              │   Step 5.    │
│   Preheat   │              │ Cream Butter │
│    Oven     │              │  and Sugar   │
└──────┬──────┘              └──────▲───────┘
       │                            │
       ▼                            │
┌─────────────┐              ┌──────────────┐
│   Step 3:   │              │   Step 4:    │
│ Prepare Pans│ ───────────→ │   Gather     │
│             │              │ Ingredient   │
└─────────────┘              └──────────────┘
```
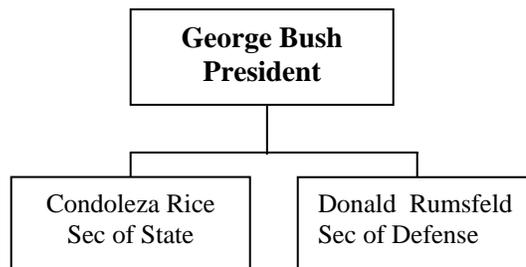
Concept maps provide visual; representations of complex themes.  There are three basic types of concept maps:  chain maps, hierarchical maps and spider maps.  **Chain maps** are useful in showing stages of development when relationships are linear and sequential.

An example of a chain map would be the steps involved with baking a cake (Fig 1).  This type of map can help learners "see" the whole process.  Filling in blank maps can help visual learners test their understanding of the different steps involved in a process.  Although it could be argued that such a process represents surface rather than deep learning, this strategy can be useful.  However life and learning are usually not as simple as baking a cake, which is where the more complex mapping strategies come in.

**Hierarchy maps** address multiple factors involved with a process or product and show the relationships of each. Like the chain map, hierarchical maps are linear in nature, flowing in one direction, from top to bottom. An organizational chart is a good example of this type of map. (Fig 2)

**Figure 2.**
Sample Hierarchical Map

```
              ┌──────────────┐
              │ George Bush  │
              │  President   │
              └──────┬───────┘
           ┌─────────┴─────────┐
┌──────────────────┐  ┌──────────────────┐
│ Condoleza Rice   │  │ Donald  Rumsfeld │
│  Sec of State    │  │  Sec of Defense  │
└──────────────────┘  └──────────────────┘
```

Like hierarchical and chain maps, **spider maps** show the relationship of major themes. (See Fig. 3)

**Figure 3.**
**Sample Spider Map**
*Factors Contributing to Success in Residency*



........... = **indirect** contributions to success
———— = **direct** contributions to success
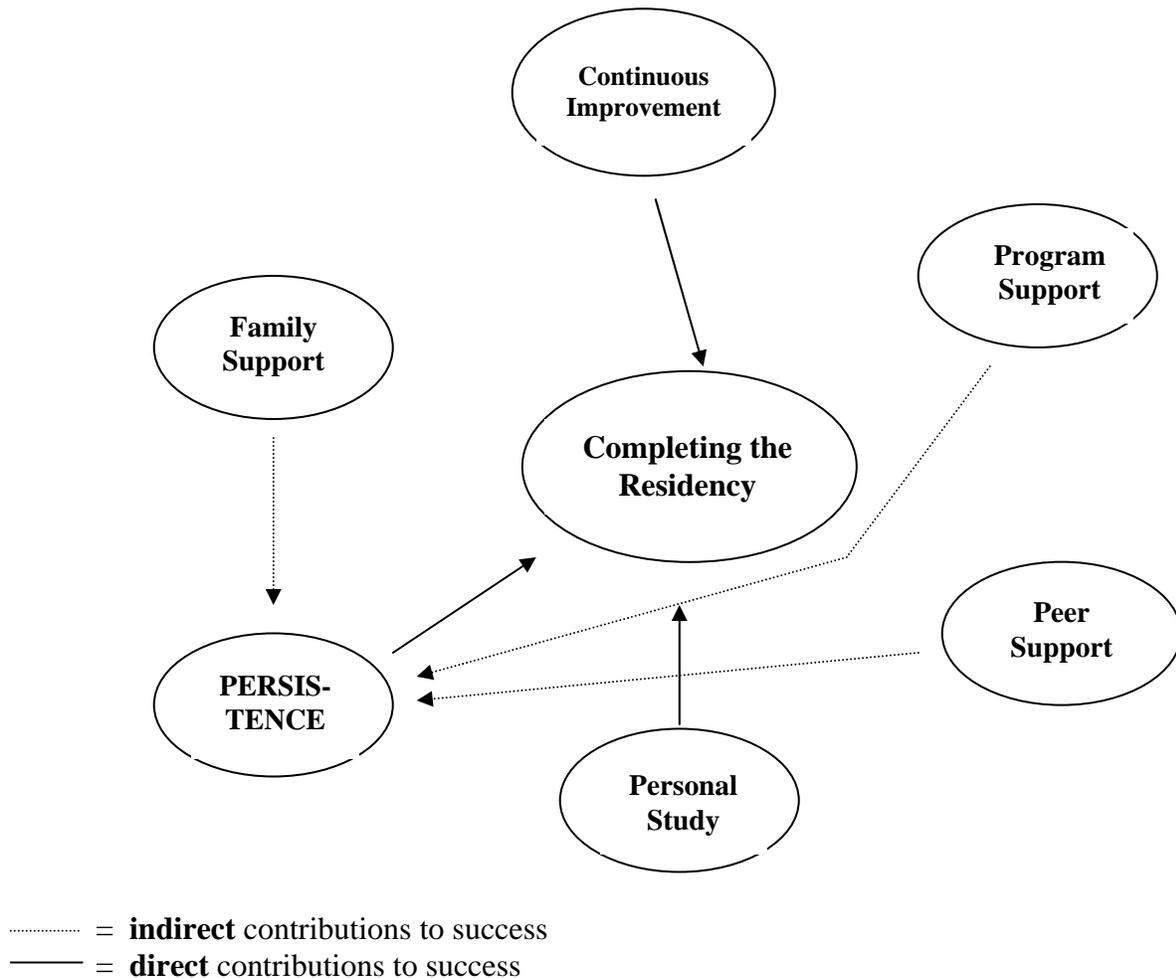
In Figure 3, we have identified some of the factors that lead to success in a residency program. Peer support, program support, and family support will obviously contribute to success as will persistence, personal study, and continuous improvement   However, the spider map makes visible the interrelationships of the different factors.  Unlike the simpler chain and hierarchy maps, spider maps are able to show more complex relationships.  A spider map identifies the elements important in a common theme as well as interrelationships.

It is worth noting that in this description of spider maps, I just used the multipurpose strategy of comparison and contrast.  By bringing it to your attention, I made you more aware of it, thus encouraging metacognitive thinking!

**Multipurpose Strategies** are relatively simple tools that many of us probably already use in our learning. They are so named because they can be used in a variety of settings. Table 2 summarizes this group of learning strategies.

**Table 2.**
**Summary of Multipurpose Strategies**

| Type of Strategy | Purpose | Examples |
|---|---|---|
| Rehearsal | Anticipating an upcoming activity | Practicing for a job interview<br>Practicing exam questions in the exam format |
| Imagery | Using a mental picture to remember a task or activity | Finding your car in the parking lot |
| Mnemonics | Learning material by means of memory device | **"RIME"** (**R**eporter, **I**nterpreter, **M**anager, **E**ducator) |

Many of us have used rehearsal to prepare for a presentation we are to give. Medical students might use rehearsal to prepare for completing a physical exam or taking a history. Imagery is also a strategy that is fairly familiar and may be easy to use. For those of us who may be spatially challenged (i.e., we can't find our car in the parking lot!) we learn to use imagery early and often. Medical education also employs many different acronyms to encourage learning and retention.

**Chunking Strategies** break large or complex concepts into smaller more manageable segments. They provide ways to sort and organize material. They can be very useful when learning about organ or disease systems, for example.

West, Farmer and Wolff (1991) describe three basic types of chunking strategies: Linear, Taxonomic, and Multipurpose. See Table 3 for a summary of their purposes as well as examples of each strategy.

**Table 3.**
**Summary of Chunking Strategies**

| Type of Strategy | Purpose | Examples |
|---|---|---|
| Linear Classification | Organize in terms of space, time or process | Historical chronology |
| Taxonomic classification | Use a sorting mechanism | Biological Systems |
| Multipurpose classification | Use a sorting mechanism | Similarities/differences<br>Advantages/disadvantages<br>Cause-effect<br>Form and function |

*Linear Strategies* chunk or organize material in terms of space, time or process. An example is a chronology of English monarchy. By sorting the different monarchs into ruling families over time, it is easier to remember them. The *Taxonomic Strategies* use a different sorting mechanism. The best example is a taxonomy as found in biology or education such as *Blooms Taxonomy of the Cognitive Domain*. Another sorting mechanism is found in the *Multipurpose Strategies*. These sorting mechanisms look for the ways that different concepts or events are alike or different. Multipurpose sorting can also look at the advantages and disadvantages of different approaches to a problem. Another type of general strategy involves categorization in terms of either cause-effect or form and function.

*Bridging Strategies* represent another aid to learning. These strategies are useful when a student must transfer existing knowledge to a new topic. Table 4 provides a brief overview of this category.

The *advance organizer* is often used to introduce new material that is based on previous knowledge. A table of contents is an example of an advance organizer. By using a table of contents, the student can get an overview of the material and begin to look for connections with previous knowledge. By using other strategies, such as chunking to compare and contrast or look for similarities and differences, the student can then better assimilate new knowledge with existing material.

**Table 4.**
**Summary of Bridging Strategies**

| Type of Strategy | Purpose | Examples |
|---|---|---|
| Advance Organizer | Introduction to new material; links to previous instruction | Review/Preview Table of Contents |
| Metaphor/Analogy/Simile | Links to previous knowledge by means of images that can allow for rapid accommodative learning | Comparisons |

The advance organizer also suggests how the new material relates to existing concepts or schema. If a teacher includes advance organizers in his or her teaching, the teacher provides a valuable learning tool for the student. By showing how different pieces of material relate to each other, the advance organizer prompts to the student to seek out important prerequisite knowledge or skills that he or she may not already possess. The student may learn the material either independently or may ask the teacher for assistance.

**Metaphors, similes, and analogies:** Like advance organizers, this group of learning activities can help a student incorporate new material. While students can use these strategies for learning, they are usually best used in teaching.

**Sources:**

Gagne, R., Briggs, L., and Wager, W. (1988). *Principles of Instructional Design.* New York: Holt, Reinhart.

West, C., Farmer, J. and Wolff, P. (1991) *Instructional design: Implications from cognitive science.* Englewood Cliffs: Prentice Hall.