

**= CHAPTER 8 =**

**Managing the  
Learning Process**

**Improving Classroom  
Retention and  
Comprehension**

*Liza was overwhelmed. She realized during her pathology test that she had not studied the right material. Rather than the anatomical features of the cardiopulmonary system she had memorized, the test focused on the relationships between cardiac output and oxygen transport with cardiac dysfunction.*

## **Information Processing**

Information processing is a cognitive science that deals with the brain's ability to sort and make sense of information. Research indicates that to best increase our ability to use and retain information, we need to consider the relationship and relevance of that information. We need to consider how it relates (in similar or different ways)

to past information and clarify how we will use this information.<sup>1</sup>

## ***Concept Formation***

We form *concepts* as we process information. A *concept* is the set of rules used to define the categories by which we group similar events, ideas, or objects.<sup>1,2</sup> We are aided in concept formation by the following strategies:

### **Use Advanced Organizers**

It helps when we label and define the concept to be learned. Categorize new information and define the attributes of the concept. For example, write titles and subtitles (such as Pathology, Signs, Symptoms) frequently in your notes and in the margins of your texts. It is important to *actively* process, categorize, and classify the information as you read.

Using a highlighter while you read is a *passive* technique that *does not* enhance comprehension or learning. Writing key notes in the margin or on another sheet of paper with a pencil is an *active* technique that enhances retention.

## Give Examples and Nonexamples of the Concept

Think of examples that would be either true or false. This may be a useful way to prepare for examinations as well. (For example, cardiac myopathy results in *decreased* cardiac output, which negatively affects oxygenated blood delivery versus increased cardiac output.)

## Apply the Information

Practice the application of *inductive reasoning* by using examples and experiences to reach a conclusion. Make up cases and see whether you can reach a diagnosis. Consider the following:

***A 54-year-old woman, status post 2 days total hip arthroplasty is complaining of severe calf pain as you enter her room for this morning's therapy session. Her calf appears reddened, hot, and swollen. What may likely be suspected given this clinical picture?***

Also practice *deductive reasoning* by using the diagnosis to predict the findings. Consider a diagnosis and see whether you can define the characteristics of a typical clinical presentation.

### **Consider the Following:**

***One of the patients you will treat for a therapist who is ill today is being seen for "wrist pain." You learn that this patient works full time as a computer programmer whose hobbies include playing interactive video games with buddies***

*that live in various parts of the country. What may be contributing to this person's wrist pain?*

As you can see from the above example, deductive reasoning involves recalling definitions and descriptions, whereas inductive reasoning involves reaching a conclusion. It may be more difficult to use inductive reasoning, as there is always the possibility that one will reach an incorrect conclusion.

## ***Improving Memory and Retention***

There are many study processes that can be used to aid memory and retention of information<sup>1,2</sup>:

### **Pay Attention**

- Attend all classes and pay close attention; hearing the same concepts repeatedly will assist you

to establish ways of conceptualizing new information.

- Sit in a classroom location where you can easily see and hear, away from distractions that may decrease your ability to pay attention.
- Study for short periods of time and use your time productively.
- Look for indicators from the instructor about what information is important.

## Use What You've Learned in the Past

- Skim reading assignments prior to class.
- Look at figures, charts, and photographs in the text that may further illustrate this information.
- Discuss previously covered content prior to the next class.

- Record and listen to lectures while driving, folding clothes, or doing other “chores.”

## **Look for Ways to Identify Important Information**

- Identify concepts that are repeated in handouts, written on the board during lectures, or displayed in transparencies.
- Highlight and organize your further reading and review around these concepts.

## **Organize the Information**

Even if the classroom presentation is not in an order that makes sense for you, try your best to impose an order in your mind and in your notes. This can be done in several ways:

- Show a logical sequence from one step to another for a procedure.

- Go from simple to complex, easy to more difficult.
- Arrange historical events in chronological order.
- Cross-reference notes by source and subject matter; identify differences and similarities.
- Explain your understanding to others, especially those who are learning the same material. Listen to what others explain to you and discuss the differences in your understanding. Consult the instructor for clarification if necessary.

## **Categorize (Chunk)**

### **Related Information**

- Develop lists to compare and contrast information. For example, create a table that lists treatment indications, contraindications, and precautions across the top and diagnostic categories down the side. See if you

can fill in all the boxes from your lecture and reading material.

- Think “across” courses. How will the information you are learning be important when it comes to guarding a patient to ensure safety? Look back at your notes and rediscover the relationship of information covered in past courses to your present learning.

## Recognize and Use Opportunities for Repetition of Learning

You will have many opportunities to do this from the academic to the clinical learning situation.

- Apply the same information or principle in different situations.
- Schedule periodic reviews of previously learned concepts and skills and see whether you can apply them to new situations.
- Jog your memory using drills and other memory techniques.

## Anchor New Information to Something You Already Know

- Think about how this applies to clinical situations you have experienced. How does this information change what you would think about or do in a similar situation?
- Use all your senses to experience the new information. What details did you notice that enhance or change your technique? How did it feel? What feedback did you receive?

## Work With a Study Group

Study groups are the single most effective way that students can improve their performance. Collaboration and group learning are effective processes that are relevant to future practice.<sup>2</sup>

- Be accountable. Students stay more focused when they have

partners or a group that is depending on their participation.

- Check your understanding. Information processing and retention is greatly enhanced by verbally summarizing learning in writing or in discussion.
- Share your thoughts and listen. In addition to aiding in retention, you may pick up a great idea, a new perspective, or a time-saving strategy by working with others.

TABLE 8-1

**LEARNING STRATEGIES<sup>2,4</sup>**

*USEFUL STEPS FOR LEARNING AND PRACTICING SKILLS*

- Write down what should be done and why and how. How should it feel? To what should I pay attention?

- Verbalize all the necessary steps in the correct sequence as you perform them.
- Rely on all your senses for feedback. Concentrate on how it feels to perform the activity smoothly and without hesitation. Maximize your chances for success in early skill practice. When you know that you are performing correctly, give yourself a chance to experience successful completion of the task.
- Break down the sequence of a complex activity into parts, and perform each part of the sequence or pattern of activity well. Anticipate the next part of the sequence and prepare yourself to be in the right position, and ensure that the required conditions exist for the next step. For example, it is important to maximize lifting safety by positioning the load close to the body prior to initiating the lift.
- Introduce variety to the performance of a skill. Now that you have mastered

the skill on the right side of the patient, are you equally as comfortable working on the left side? Can you plan for the differences required?

Adapted from Graham CL. Conceptual learning processes in physical therapy students. *Phys Ther.* 1996;76:856-865 and Hunter M. *Mastery Teaching*. Thousand Oaks, CA: Corwin Press; 1994.

## Psychomotor Learning

Many skills that physical therapist assistant students must learn involve *psychomotor learning*, requiring physical movement, as well as a cognitive component. Most therapy skills involve both cognitive and physical components, such as operating machines, lifting a patient, using a computer or remeasuring a patient. Howard Gardner's theory of multiple intelligences suggests that different abilities can be separately developed and that there may not be such a close link between different types of

abilities, such as kinesthetic and verbal abilities.<sup>3</sup>

## ***Basics of Skill Learning***

An understanding of the following principles will aid in psychomotor learning:

- **Avoid trial and error learning.** When learned, a skill is not “unlearned”; it is only replaced by the learning of another skill. Therefore, it is important to avoid trial and error learning, which may create bad habits that later have to be corrected. Concentrate on what you are learning, solicit feedback, and correct your performance. This will prevent your having to relearn later.
- **Perfect practice makes perfect performance.** Practice is required for skill acquisition. It is important that the practice be guided; practice only makes per-

fect if what is being practiced is correct.<sup>4</sup> Learning incorrect methods can interfere with progress. Effective practice provides for knowledge of results that reinforces and motivates future action.

- **Be patient.** Fatigue and complexity of material to be learned interfere with the speed of learning. Be patient and use all of your senses (vision, hearing, and feeling) to process learning and practice. Schedule frequent, short practice sessions and stop when you feel fatigued. Work with different partners and be open to honest feedback from your “patient” as to how it feels to have you moving them or performing an intervention.
- **Think first.** Be careful when transferring learning from one situation to another. Different patient positioning or different

physical environments may create a need to perform differently. Think before you act.

We all feel awkward at times. Seasoned physical therapists and physical therapist assistants may become particularly gifted at various aspects of performing interventions, but students must be able to learn how to competently perform all skills required for successful entry-level practice. The steps in [Table 8-1](#) may aid your psychomotor learning.

## Facilitating Clinical Learning

*Morgan reviewed her mid-term CPI evaluation and read her clinical instructor's comments: "Morgan seems to have difficulty with identifying important changes in the patient's per-*

*formance.” The clinical instructor later explained that she would like to explore what is happening that prevents Morgan from focusing on these changes.*

First, we must acknowledge that clinical information processing uses a monumental amount of information. Students must read and digest pertinent components of the patient’s medical record, including the physical therapist’s initial evaluation with plan of care, and they must participate in data collection, observe physical signs and symptoms, and select from long-term memory the appropriate clinically relevant information needed to adjust or withhold treatment based on the patient’s status and responses to intervention.<sup>5</sup> The environment is full of information that must be filtered and processed. How can we most effectively accomplish this task? What do we know about clinical information processing?

## ***Novices and Experts***

It may be useful to look at what differentiates *novice from expert* performance. Novice and expert performance tends to follow certain patterns. There is quite a bit of evidence that these types of behaviors occur across professions and/or subject matter.[6-10](#) Think of an area in which you have developed expertise, such as computer use or playing the game of chess. See if the following descriptions sound familiar to you.

### **Novice Performance**

The novice focuses primarily on objective findings and observable signs and rules to use to make decisions. The novice's performance is governed by these rules and may lack flexibility. The novice tends to be concerned with details and may not have the ex-

perience base to be able to prioritize which information is critical and which is not. Novices tend to use systematic approaches to try to control the huge amounts of information that bombards them. Detailed forms, lists of checklists, and protocols are very comforting for a novice.

## Expert Performance

The expert, on the other hand, largely uses an intuitive process, looking at the whole picture, and modifying his or her approach in response to deviations from expectations. Expert performance is characterized by its fluid and flexible nature. The expert is able to simultaneously carry on a conversation and make observations. Much of this process goes on “in the expert’s head” and is often not verbalized. An expert often unconsciously and automatically processes a great deal of information and arrives at a conclusion, often without a systematic or organized approach

to arriving at a decision. Most importantly, the expert processes information *within a context*, with a view that recognizes cues and vital information that changes from situation to situation.<sup>10</sup>

Where novices tend to use more of a “rule-oriented” process, the expert tends to have a more holistic view. Let’s look at some evidence that further defines the process.

## ***Pattern Recognition***

There is evidence that experts retain information by organizing it in familiar patterns. Research conducted on physicians and medical students showed that physicians differed from medical students in their recall of critical information in a written text. Physicians showed significantly greater recall of critical cues and made more accurate diagnoses than did the medical students when the information was presented in a pattern that they were

used to seeing (medical history/physical examination/laboratory findings). The recall of physicians decreased to the level of the medical students when the same information was presented in a random order.<sup>11</sup>

The expert is different from the novice by his or her ability to *recognize and interpret* critical cues in *patterns of information*. Students need support in developing their thought processes to see these patterns. There are some specific steps that students can take to identify and organize the information in the environment.

## Steps to Better Information Processing

Cognitive psychologists have identified that each of the following steps aids in our information-processing abilities. Students and their instructors can

systematically approach the task of decision making by using some of the following guidelines.<sup>12</sup>

## ***Identify the Key Cues***

A *cue* is something that grabs your *attention*. It might be a note written in a chart, an observation of a sign or symptom, or a key question that you ask the patient. Ask yourself the following questions:

- What are the key cues I am seeing, hearing, or feeling?
- Do they differ from my instructor's view? Identify those differences.
- What cues are most critical? Think of the intensive care unit, with monitors beeping, phones ringing, and many conversations going on simultaneously. To what must I pay attention to know that the patient is okay? How do I know whether a pa-

tient receiving gait training will be safe to walk by him- or herself to the bathroom?

## ***Organize and Prioritize the Cues***

The next step is to organize the cues into logical units of information. This involves prioritizing information and organizing it in a way that one is able to identify patterns. (For example, a physical therapist assistant identifies that a patient has difficulty with sitting balance on the edge of the bed. There are many other activities that involve sitting—some supported, some unsupported. This patient may have difficulty in all sitting positions, such as in a wheelchair or on a toilet. These cues have implications for safety precautions for all activities of daily living.)

Systematically collecting and recording various pieces of information into categories, such as subjective information from the patient, family,

or caregiver; objective data-collection measurements and observations about patient performance and reactions; judgments regarding patient status and progress towards goals established by the physical therapist; and treatment planning within the plan of care established by the physical therapist, serves this purpose well.

The following questions may help to organize the cues:

- What subjective information have I elicited that is of greatest concern?
- Does the patient have a significant past medical history as I consider the patient's current status?
- What are the positive findings of the tests and measurements? Are there any red flags?
- What medications may interfere with performance?
- What findings indicate the need for further follow-up?

- What information may change the approach I take (such as how the patient responds, patient preferences, or occupational demands)?

## ***Reviewing the Pattern***

The *Guide to Physical Therapist Practice*<sup>13</sup> has established practice patterns for many diagnostic groups. As an initial step, it may be helpful to consider what pattern applies to the patient based on the physical therapist's examination and diagnosis. This will help to guide your thinking, jog your memory, and make a well-reasoned decision regarding the interventions you may choose within the therapist's established plan of care. The following questions may be helpful:

- What patterns of signs and symptoms do you expect with certain diagnoses? For example, hyperactive deep tendon reflexes

and paralysis are consistent with an upper motor neuron lesion.

- What time frame do you have to work with the patient before the physical therapist's goals are expected to be reached?
- What is your reasoning in using specific critical pieces of information to monitor this patient's progress?

## *Identify Deviations*

### *From the Pattern*

This step of the process is the most difficult, as it requires constant attention to the cues in the environment, as well as reconsideration of the assumptions you may have made. Initial impressions may lead to false conclusions unless you take this essential step. Consider this case:

*Mr. Atkins has experienced worsening back pain since his last therapy visit on Friday. You learn that he began to feel worse while gardening over the weekend. He can hardly walk into therapy on Monday due to intense pain and numbness in his left leg. You notify the physical therapist, who comes right over to examine Mr. Atkins. The physical therapist calls the patient's physician while the patient waited. The physician requested that the patient be sent right over to be examined.*

This physical therapist assistant's action led to the patient's immediate trip to his physician. The patient was soon diagnosed with a prolapsed disk and was scheduled for decompressive laminectomy later that week. Deviations from the pattern are important because they change the expected course of action. They may indicate

problems, precautions, or referrals that physical therapists must make. The following questions may assist you to start this process:

- What critical pieces of information are not fitting the expected pattern?
- How do this patient's signs and symptoms deviate from what I typically see?
- Are there complications, contraindications, or precautions that may result from these deviations?
- Do I need to contact the physical therapist *now* or have the physical therapist see the patient on the next visit?

## ***Synthesize and Draw Conclusions; Integrate Information Into a Plan***

The key question here is, “*So what?*” What difference does it make that I

know this information? You may reach any of the following conclusions:

- Knowing this, I might choose one approach over another.
- Knowing this, I will have to involve the patient's caregivers in my plan.
- Knowing this, the patient may not be able to participate in the indicated duration or frequency for optimal treatment.
- Having identified symptoms that do not fit in the expected pattern, I am going to contact the physical therapist to discuss my concerns and have the patient re-examined.

After developing a diagnosis and prognosis, the physical therapist designs an intervention, including a plan of care that is intended to result in expected changes in the condition. It is within the intervention component of practice that the physical therapist assistant makes the clinical judgments

necessary to adjust or withhold intervention, weigh alternatives, and select appropriate responses within the plan of care established by the physical therapist.

## ***Metacognition and Reflection***

*Metacognition*, or an ability to monitor and alter one's process of thinking, assists in helping to refine the process of problem solving. The multidimensional and complex nature of the clinical environment requires constant processing of clinical information. "Thinking about one's thinking" provides insight into attention, pattern recognition, and clinical reasoning processes.

Evidence supports the value of *reflection* during the learning process.[11,14,15](#) Reflection allows us to consider the meaning of information and the thoughts we had in response to this information. Reflection includes both

consideration of the procedure and the interaction involved.

Research has shown that reasoning in physical therapy occurs in context, with cues and patterns of information developing different meanings in varying conditions. The knowledge base of experts in the physical therapy field develops through reflection.<sup>10</sup> With increased experience and engagement in reflective processes, physical therapists are able to develop reasoning processes that incorporate multiple perspectives.<sup>15</sup>

## ***Lifelong, Self-Directed Learning***

Both physical therapists and physical therapist assistants assume responsibility for their own career development, long after the formal educational program ends. Reflection provides a key tool to identify, select, and critique appropriate learning needs, tasks, and re-

sources and formulate new knowledge to address these needs.

Maintaining an active learning environment promotes independent thinking and an atmosphere where learners have responsibility for learning. Recent evidence shows that novice physical therapy clinicians report learning through everyday practice in the clinical environment, including the interactions with colleagues, mentors, patients, and families.<sup>16</sup> It is beneficial for students to seek answers to their questions on their own, rather than always relying on faculty to provide answers. Such self-directed learning helps learners to improve their self-assessment skills and to develop self-reliance. Students who develop a pattern of independent learning while in school will find these skills invaluable for lifelong learning and continuing career development. See [Chapter 24](#) for more strategies for lifelong learning.

# Summary

There is ample evidence to support a systematic approach to information processing to facilitate student learning. Researchers have found that methods of clinical reasoning differ in novices and experts in predictable ways.

Principles of information processing can be applied to clinical learning to enhance clinical problem solving. Further, an active consideration of one's thought processes and reflection on one's experiences facilitate development of one's base of knowledge.

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# PUTTING IT INTO PRACTICE

1. Select your class notes from one class period in a course you are currently taking. Reference the material to your books and reading assignments by writing notes in the margins. Note any discrepancies by asterisk. Make an appointment to talk with your instructor about any discrepancies you find or questions that arise during this activity.
  
2. Identify a new motor skill you are learning. This might be performing a transfer, guarding a patient during gait training, or doing a “wheelie” in a wheelchair.

Write down what should be done and why and how.

How should it feel? To what should you pay attention?

Write down all the necessary steps in the correct sequence of performance.

3. Choose a class session to analyze. Reflect on what drew your attention during this class.

What were the cues to which you responded?

What was most important in the material covered or the skills learned?

Reflect on how you might apply this information. Why is it important to know?

