Educational standards for athletic training education requires that all students are exposed to the theoretical background of psychomotor skills and have the opportunity to practice the skills in a sequential and progressive manner in a controlled and supervised environment. Athletic Training Education Programs (ATEPs) incorporate a variety of cognitive and metacognitive processes to enhance student learning of psychomotor skills. The concepts of cognition and metacognition have been identified as vital components related to the development of clinical reasoning skills. Cognition is defined as the development of critical thinking skills, whereas metacognition relates to reflective thinking that characterizes a “self-directed learner.” A shift from teacher-centered to learner-centered education requires more emphasis focused on the development of “self-directed learners” through various instructional strategies. This report presents an instructional strategy that utilizes a three-dimensional theory of mastery, which incorporates metacognitive processes in academic preparation.

Three Dimensional Theory

Meichenbaum and Biemiller have presented a three-dimensional theory of mastery for learners and instructors, which incorporates a model that explains how students progress from mastering simple tasks to mastering more complex tasks, and which provides instructors with guidelines to facilitate the process. The Skill and Vocabulary Dimension organizes skill domains into hierarchies, i.e., simpler skills that are learned first and followed by acquisition of more complex skills. This dimension relates to level of skill difficulty and the complexity of concepts associated with acquisition of the skill. To facilitate learning in this dimension, a teacher may convey authentic experiences during lecture that relate to a particular skill and its completion. Scenarios, problem-solving, and case studies can also be used to enhance this learning. These teaching strategies require students to become more engaged with the course content, which has been shown to be effective in didactic coursework. Although this approach requires more student feedback, engagement assists students in retaining information as they progress from simple concepts to more complex concepts. This hierarchal progression is an essential construct of the theory of mastery.

The second dimension of mastery is the Planning and Application Complexity Dimension. The most difficult challenge for facilitation of learning in this dimension is the identification of previously learned skills that will be relevant to a different problem or task. Planning is a critical aspect of this effort to facilitate transfer of knowledge and skills to similar tasks and different situations. Once concepts are clearly understood and basic skills have been developed, students can apply them without much conscious effort. Application complexity relates to the number of decisions the student has to make in solving a problem. Development of a strategy to gain a thorough understanding of concepts relating to a given task may be easy or difficult, depending on how many skills must be coordinated to accomplish the task. Peer-assisted learning (PAL) can assist students in the development of such strategies. A novice student can utilize the knowledge of more experienced student to assist him or her in learning or reviewing clinical skills and progressing skill integration. PAL has been found to facilitate development of
increased confidence in clinical skill application and decision making.\textsuperscript{7-10}

The third dimension is the Self-Direction Dimension. The goal of instruction in this dimension is to promote utilization of previously learned information to solve a new problem or complete a new task, which requires the student to plan the task, implement and monitor his or her performance, and evaluate the results.\textsuperscript{2} Immediate feedback from an instructor can help a student move rapidly through performance of a new task, which increases the efficiency of the learning process by limiting the amount of time spent “floundering” in an effort to perform each component of the task in a correct manner.\textsuperscript{11} On the other hand, delayed feedback allows the student to retain control over the problem-solving process, which makes it more deliberate and reflective.\textsuperscript{11} The student progresses in the Self-Direction Dimension when the instructor or peer reduces the amount of feedback provided during performance of the task or problem-solving scenario.\textsuperscript{2} Table 1 provides examples of the manner in which each dimension of mastery can be integrated into athletic training education.

**Development of Self-Direction**

The development of self-direction is the ultimate goal of mastery-oriented instruction. Three phases of self-direction development include (a) acquisition, (b) consolidation, and (c) consultation.\textsuperscript{2} Acquisition relates to student observation, imitation, and action with guidance provided by an instructor, i.e., the student is “learning how” to apply a strategy, solve a problem, or complete a task by modeling the instructor’s performance. Teachers have a “direct instructing” role when students are in this phase of learning.

Athletic training educators should encourage students to achieve self-direction, especially in the mastery of psychomotor skills. The Directed Instruction Model has been advocated as a practical approach to teaching psychomotor skills in athletic training education.\textsuperscript{12} This model may be particularly effective for introduction of a new skill to students, i.e., “each student is presented with the step-by-step format in a controlled, academic and focused environment.”\textsuperscript{12} The students must be provided with an adequate amount of time to participate in guided practice in order to facilitate mastery of the skill. The students can then incorporate the information into “higher orders of learning”\textsuperscript{12} (i.e., analysis, synthesis, and evaluation).\textsuperscript{13}

During the consolidation phase, the students perform skills demonstrated by the instructor.\textsuperscript{2} To reinforce correct completion of the task, instructor-guided practice is provided. Through guided practice, the student can self-evaluate procedures with a focus on those that are most relevant, which improves the efficiency the process.\textsuperscript{2} The term “scaffolding” refers to alternating provision and removal of instructional support as the student works toward skill mastery.\textsuperscript{1,2} The goal of scaffolding is to give the student just enough guided practice to ensure correct completion of the skill. This phase requires the development of a dynamic relationship between the instructor and the learner. The student directs the task when he or she can demonstrate its correct completion, but direction from the instructor is still provided when necessary.

The consultation phase has been achieved when the student can perform the skill and plan specific applications while providing assistance to other students who are learning the skill (i.e., PAL).\textsuperscript{2} A student who is in the consulting phase can develop innovative strategies for performance of new and more difficult tasks.\textsuperscript{2} The instructor becomes a mentor who enters into a more collaborative relationship with the student.

Table 1 presents examples of techniques for integration of each dimension of mastery into athletic training education. The scenario outlined at the beginning of Table 1 provides an example for utilization of teaching strategies for each of the three dimensions of mastery. This exercise allows the student to move through the three dimensions of mastery.

**Summary**

The mastery theory of Meichenbaum and Biemiller\textsuperscript{2} emphasizes the importance of self-directed learning. Effective educational programs provide opportunities for students to progress through acquisition, consolidation, and consultation phases of learning. Metacognition enhances a student’s ability to reflect on what he or she has learned and the process of learning, which facilitates self-assessment of performance. Teaching techniques that help to develop metacognitive skills include dialogue discourse, group projects, simulations, and problem-based learning.\textsuperscript{2} Cognition and metacognition are essential for development of critical thinking and reasoning skills.\textsuperscript{1} Utilization of “learner-centered” techniques can help students to become more self-directed learners.