



**Indicator:** All teachers teach methods of logic, synthesis, evaluation, and divergent thinking. (D9)

**Explanation:** Higher-order and critical thinking, such as logic, synthesis, evaluation and divergent thinking, are purposeful, reasoned, and goal-directed. Metacognition enables and is enabled by critical thinking skills. Teachers must provide explicit instruction to show students how to transfer critical thinking skills across domains. Effective critical thinking instruction also includes collaborative/cooperative learning and student-centered, constructivist instructional approaches.

**Questions:** What are higher-order and critical thinking skills and how do they relate to metacognitive competency? What are the best ways to teach higher-order and critical thinking skills and foster the development of students' metacognitive competency?

*What are higher-order and critical thinking skills and how do they relate to metacognitive competency?*

Higher-order and critical thinking are purposeful, reasoned, and goal-directed, and are essential for student preparation for post-secondary education and the workforce (Lai, 2011). Higher order and critical thinking skills are those activities that go beyond the stage of understanding and lower-level thinking, such as memorization and recall of information, to more complex skills, such as analyzing, synthesizing, and evaluating (Bloom, 1956). Higher order and critical thinking can be conceptualized as a non-algorithmic, complex mode of thinking that often generates multiple solutions (Resnick, 1987). Such thinking may include uncertainty, application of multiple criteria, reflection, and self-regulation. Learning experiences that contribute to the development of higher order and critical thinking skills focus on analysis, evaluation, and synthesis and develop problem solving, as well as inference, estimation, prediction, generalization and creative thinking skills (Wilks, 1995). Additional examples of higher-order and critical thinking skills include: question posing, decision-making, and systemic thinking (Dillon, 2002; Zohar & Dori, 2003; Zoller, Dori, & Lubezky, 2002).

Critical thinkers do so without prompting, and usually with conscious intent, in a variety of settings. When people think critically, they are evaluating the outcomes of their thought processes—how good a decision is or how well a problem is solved (Halpern, 1996, 1998). Lai (2011) compares metacognition and critical thinking:

Metacognition (or thinking about thinking) supports critical thinking in that students who can monitor and evaluate their own thought processes are more likely to demonstrate high-quality thinking. In addition the ability to critically evaluate one's own arguments and reasoning is necessary for self-regulated learning. (p. 42)

Developing higher-order skills is important because they facilitate the transition of students' knowledge and skills into responsible behavior in society (Ben-Chaim, Ron, & Zoller, 2000; Zoller, 1993, 1999, 2001). Perkins and Unger (1999) suggest, "Understanding a topic is a matter of being able to think and act creatively and competently with

what one knows about the topic....The ability to perform in a flexible, thought-demanding way is a constant requirement” (p. 97).

Halpern (1998) further argues that the information explosion is yet another reason why specific instruction in thinking needs to be provided. The wealth of information available from the internet can be overwhelming, especially for young people who are still in the early stages of interpreting, digesting, and evaluating disparate pieces of information. Further, she suggests that the dual abilities of knowing how to learn and knowing how to think critically about information are important 21st century skills. Zoller (1999) asserts that because education is our principal means of preparing students to be responsible citizens in society, schools, at all levels, should assume responsibility for teaching higher order thinking skills.

*What are the best ways to teach higher-order and critical thinking skills and foster the development of students’ meta-cognitive competency?*

Students can become better thinkers as a result of appropriate instruction, but this instruction must also involve transfer of thinking skills across domains and contexts. Students benefit most from a mixed approach that combines general critical thinking skills as a standalone initiative with focused efforts to integrate these skills within the context of specific subject matter (Abrami, et al., 2008). Teachers will also likely need specific training in providing explicit instruction to foster their students’ critical thinking in order for students to truly benefit (Abrami, et al., 2008). To encourage transfer of critical thinking skills, training should involve explicit instruction in how to transfer these skills by providing plenty of opportunities to apply the skills in a wide array of subjects and contexts (Halpern, 1998). It should also include an emphasis on metacognitive skills such as planning, goal-setting, and self-regulation/monitoring (Kennedy, Fisher, & Ennis, 1991, as cited in Lai, 2011). Students should also be taught to recognize problem structures across various domains (e.g., math, science social studies) so that they may deploy appropriate learning strategies (Halpern, 1998).

In their meta-analysis of 117 studies on the impact of critical thinking instruction, Abrami, et al (2008) concluded that the most effective instructional programs included 1) explicit instruction with plenty of teacher modeling of critical thinking strategies; 2) collaborative

or cooperative approaches involving students working together; and, 3) constructivist, student-centered approaches that amplify student ownership of their learning through their use of strategies (such as KWL and exit tickets that identify what they have learned and areas where they need help) as well as problem-based learning approaches.

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