Teaching Chapter 7

***Higher-Level Thinking:***

Moving Beyond Basic Knowledge to Higher Levels of Critical

And Creative Thinking

Key Instructional Goals of this Chapter

The key goals of this chapter are to provide students with:

(a) a clear definition and description of what constitutes higher-level thinking,

(b) a carefully-organized classification of different varieties or forms or types of higher-level

 thinking, and

(c) concrete illustrations of how higher-level thinking may be applied and demonstrated to

 improve academic performance in college and beyond.

Motivating Students for this Chapter

This chapter may be the heaviest and headiest one of the text, and it’s one that students will probably need the most instructional support and structure to master. To ignite students’ motivation for the material included in this chapter, point out to them that becoming a critical and creative thinker is a cumulative process; if they can make the effort to establish good habits of good thinking skills early in their college experience, they are likely to evolve into natural habits that can be applied almost automatically to improve the quality of their academic performance in all courses. Moreover, higher-level thinking is a lifelong learning skill that they can use to promote personal and professional success beyond college.

***DEFINE*** It:

Help your students get a handle on what

“higher-level thinking” actually means

A great deal of inconsistency exists in the scholarly literature with respect to how “critical thinking” is defined and described (Fisher & Scriven, 1997). Following a 25-year review of the critical thinking literature, McMillan concluded that, “What is lacking in the research is a common definition of critical thinking and a clear definition of the nature of an experience that should enhance critical thinking” (1987, p. 37). Definitions of critical thinking have ranged from the very specific—a well-reasoned *evaluative* judgment or critique (King & Kitchener, 1994), to the very general—an overarching concept that includes all forms of *higher-level* thought processes, known as “higher-order thinking skills” (“HOTS”), i.e., all mental operations than are “higher” merely retaining knowledge or recalling factual information (Bloom, 1956; Greeno, 1989; Anderson & Krathwohl, 2001). Thus, scholarly definitions of critical thinking have ranged from the very *narrow*—referring exclusively to a well-reasoned evaluative judgment, to the very *broad*—all thought processes that are more complex than simply acquiring knowledge or retaining factual information.

 In chapter 7, we adopt the broader, more inclusive definition and decided to call it *higher-level thinking* (HLT), which we define as all thought processes that are higher than memorization or basic comprehension. In the text, we describe *learning* as taking place in three progressively higher levels or forms: (1) memorization (surface learning), (2) comprehension (deep learning), and (3) higher-level thinking (higher than memorization and comprehension), which builds on both knowledge and basic comprehension to move to higher levels of cognition (e.g., critical and creative thinking).

 We adopt a broad definition of HLT that embraces a wide variety of specific cognitive processes or mental activities that are loosely referred to as *critical thinking*. We elected not to use the term “critical thinking” as a generic label for all of these mental processes; instead, we define it as a particular form of higher-level thinking that involves an evaluative judgment (as in the word, “critique”). This is an important distinction, not only for the purpose of definitional clarity, but also for the practical purpose of combating the prevalent student misconception that critical thinking simply means being “being critical.” (This common student misconception is one reason why we chose to title chapter 7, “Higher-Level Thinking,” instead of “Critical Thinking.”) Thus, at the very start of this unit, it may be worth taking some time to clarify for your students that critical thinking is *not* synonymous with being critical. You can jump-start this clarification process by using your students’ responses to the “Activate Your Thinking” prompt at the start of the chapter.

 We wish the language of thinking were simpler and more universal, but the reality is that there is considerable variation and imprecision in the higher education literature with respect to defining concepts such as “memory”, “learning”, “deep learning”, “critical thinking”, and “higher-order thinking.” Thus, we elected to adopt our own working definition and classification system that would lend some consistency and provide some direction for helping students develop a language for higher-level thinking. Just as content-based academic disciplines have developed their own vocabulary of precisely-defined terms that serves to advance the discipline and students’ mastery of it, so, too, should thinking have a well-defined vocabulary that describes it and advances students’ mastery of it. Language can shape and influence human thought, and thinking is akin to an “internal conversation” or silent monologue. Thus, it is reasonable to expect that if students learn to speak the language of higher-level thinking, it will increase the likelihood they will begin to develop the mental habit thinking at a higher level.

 Once students are clear on what higher-level thinking means, and understand that there is more to it than critiquing or criticizing something or somebody else, you can then turn to clarifying the *recurrent theme* that unites all forms of higher-level thinking, namely: it is thinking at a higher level than merely memorizing or comprehending information.

***REFINE*** It:

Help students identify the various forms in which HLT can be displayed

Once you have defined HLT in terms of its common theme, you can proceed to identify *variations on the theme*—i.e., the various forms or varieties of HLT. One way to simplify the process of identifying all the forms of higher-thinking skills described in chapter 6 is to organize them into the following sets of complementary or contrasting pairs:

1. ***Inferential/Applied***: using thinking to draw *mental inferences* (conclusions) or to address

 *practical problems*.

2. ***Adduction/Refutation***: marshalling evidence *for* or *against* an argument.

3. ***Dialectic/Dualistic***: thinking in terms of *relative strengths & weakness*, versus

 *absolute* *terms* (black-and-white, right-or-wrong).

4. ***Balanced /Multidimensional***: viewing issues from *both sides*, and from *diverse*

 *perspectives*.

5. ***Analysis/Synthesis***: *breaking down* or *building up* ideas.

6. ***Convergent/Divergent***: thinking with a *narrow* focus aimed at reaching a *single* idea,

 and *wide*-focus thinking aimed at generating *multiple* ideas.

7. ***Creative/Critical***: *generating* new ideas and *evaluating* existing ideas.

***ILLUSTRATE*** It:

Give Student Concrete Examples of HLT

**Provide students with *thinking verbs* to illustrate the *mental actions* that represent**

**higher-level thinking**.

 The set of HLT question stems on pp. 181-182 of the text can be conveniently used

for this purpose.

 ***Model* higher-level thinking for your students**.

 For example, rather than simply sharing or supplying students with solution strategies for college adjustment problems or challenges, situate yourself in the problem situation as if you were a student and think through the problem-solving process out loud. This enables you to demonstrate or model higher-level thinking for your students, and allows them to focus on the *process* of conceptual steps you take in solving the problem, rather than attending to the final product (solution). You could ask students to bring college-adjustment issues or dilemmas to class for you to solve and showcase HLT in the process of solving them.

 A variant of this procedure is to role-play *thinking errors* that students often make with respect to college issues—for example, errors that students make when thinking through their reasons for choosing a college major, or when attempting to write a persuasive paper. (The reasoning errors described in the textbook on pp. 173-74 may be used for this purpose.) Ask your class to diagnose the type of thinking error you committed and correct it with a more effective thought process.

*Prompt* or*Provoke* HLT in your Students

**Pose *questions* to students that are intentionally designed to stimulate HLT**.

 The “Questions for Stimulating Different Forms of Higher-Level Thinking” (pp, 181-82) may be intentionally used toiHH mayma promote higher-level thinking in class. These questions can be inserted strategically into your class notes and posed at times when you’re covering an especially important issue.

 HLT questions may be posed for the purpose of generating general class discussion or as a focal point for small-group discussions. Students could also be asked to write a one-minute paper in response to the HLT question you’ve posed and then discuss their written responses in class. This writing-before-speaking strategy encourages students to engage in personal reflection first, which sends the signal that they should take time to gather their thoughts before expressing them.

**Create cognitive *dissonance or disequilibrium* in the minds of students with respect**

**to course concepts and issues.**

 This strategy promotes HLT by forcing students to look at issues from more than one perspective or viewpoint (Brookfield, 1987; Kurfiss, 1988). The following practices are recommended as strategies for inducing cognitive dissonance or disequilibrium.

\* Persuade students to *buy into* a certain position, then immediately proceed to “turn the table” and *expose its flaws*.

\* During class discussions, raise questions that call for *multiple student perspectives*. For example, “Who doesn’t agree with what’s being said?” “Would someone else like to express an opposing viewpoint?” Or, at the end of class discussions, assign a *one-minute paper* that asks students if there were any points made or positions taken during the class session that they would strongly question or challenge. You could then use their responses as springboards for discussion in the next class session.

\* Invite and encourage your students to *disagree* with ideas you present *in class* or that are presented *in the text*. You should feel free to openly disagree with an idea presented in the text, thereby pitting the views of two different authority figures against each other (teacher and author); this practice not only serves to create cognitive dissonance, it also helps students realize that knowledge is often not absolute or fully known and owned by an authority figure.

\* Invite *guest speakers* to visit class who have *differing viewpoints* on a topic or issue. For example, invite faculty members who hold different positions on a contemporary moral or social issue, or invite faculty from different academic departments to illustrate how different disciplines use critical and creative thinking in different ways to advance knowledge in their respective fields.

\* Show *TV programs involving debates or panel discussions* among authorities who hold differing positions, and stop them at key times or junctures to engage the class in class discussion.

\* Show TV *advertisements* designed to persuade or convince consumers to purchase products and have students analyze the logic (or emotion) underlying the message.

 ***Apply* It**:

Give Students Multiple Opportunities to *Practice* HLT

If we expect students to develop higher-level thinking skills, instructional methods need to be used that require them *do* something to or with course content other than reading about do it, or listening to us talk about it. Thinking may be viewed as a mental habit, which, like any habit, is likely to persist once it has been established. If we want students to become good thinkers, they need to be given opportunities to repeatedly practice good thinking early in their college experience so it begins to evolve into a natural habit that they can apply routinely across the curriculum and throughout their college experience. The following strategies are recommended for providing students with opportunities to apply and practice HLT in the first-year seminar.

**After students communicate their ideas in writing or during class discussions, have them *reflect on their thought processes* to assess whether they engaged in higher-level thinking and to identify what form of if they put into practice.**

 This recommendation can be implemented by simply giving students some “pause time” after exercises and assignments, during which they can reflect on the quality of their thinking and whether they demonstrated thought processes and attitudinal qualities associated with HLT. For example, after a small-group or whole-class discussion, have students reflect on the form of HLT that was called for by the discussion question and the type of thinking they displayed during the discussion. Students can share their personal reflections orally or in writing (e.g., in the form of a short, post-discussion minute paper).

Research indicates that the habit of “meta-cognition” (thinking about one’s thinking) can be learned by students with the help of thinking self-assessment questions. When students learn to routinely ask themselves questions that promote meta-cognition, the depth or quality of their thinking is enhanced (Resnick, 1986). Students can use the taxonomy of higher-level thinking questions in chapter 7 (pp. 181-82) as a self-assessment guide for determining whether they are actually engaging in the process of higher-level thinking when they speak, write, or study. Also, students can use the “Characteristics of Higher-Level Thinkers” on p. 186 as a self-assessment guide for evaluating whether they’re displaying the personal qualities that characterize higher-level thinkers.

**Play the role of *devil’s advocate* to help students see the limitations associated with**

**different arguments and positions.**

 For example, if students state an argument or take a position, keep asking the question “Why?” until it can be taken no further. Or, ask questions such as:

(a) “How do you know that you know, or that it’s so?”

(b) “How did you arrive at your conclusion?”

(c) What source(s) of information or experiences provided the basis for your conclusion? Questions such as these help students think through and express the reasoning process underlying their arguments and positions, rather than simply stating the end product of their thinking.

 Research indicates that the quality of students’ thinking is enhanced when they are asked to think aloud while solving problems (Resnick, 1986). Thinking aloud causes students to consciously focus on their thought process, and convert their covert thoughts into overt actions (spoken words) that are observable and more amenable to being evaluated and improved by the thinker and by others (Resnick, 1986).

**Have students engage in “reverse thinking” by asking them to *switch their original***

***position* on an issue being discussed in class.**

 This practice serves to combat either-or/black-or-white thinking and prompts students to adopt more balanced positions on controversial issues.

**Have students research and prepare to *defend both sides of an issue*, then randomly**

**assign them to argue for one side.**

 Two students may be given the assignment of researching both sides of a college-life issue, such as what should be the legal age for alcohol use. Before the debate begins, a flip of the coin could determine which side of the issue each student will take.

**Use *student-centered* instructional methods that take you “off stage” and allow**

**your students to gain access to the perspectives of their peers**.

 Student-centered teaching reduces the likelihood that your class will perceive you as the absolute authority who knows all the answers (and does all the thinking) while students sit comfortably (and mindlessly) taking notes on the pearls of wisdom you cast their way. When students are required to engage in face-to-face discussion of course concepts with their peers, they’re more likely to develop HLT skills than by listening to lectures and rote recording of their instructors’ ideas.

 Peer interaction and collaboration can serve as a powerful educational resource for advancing students’ cognitive development and higher-level thinking skills (Kurfiss, 1988). Since higher-level thinking involves risk-taking, students are more likely to take the risk of expressing their ideas and sharing their viewpoints in the sanctuary of a small group of peers. Student-centered teaching removes the potentially inhibiting presence of an authority figure by taking the “sage off the stage” and allowing students to assume more ownership or control of their own learning.

**The *Content* for Small-Group Work: Higher-Level Thinking *Topics* or *Focus Points***

 Ideal HLT tasks for small-group work are those that involve:

(a) making difficult choices or decisions,

(b) taking a side on a debatable position,

(c) discovering potential solutions to a vexing problem, and

(d) identifying possible resolutions to a thorny issue or dilemma.

Such thought-provoking tasks lend themselves naturally to higher-level thinking, especially when students are encouraged to express and grapple with their differences, and attempt to reach consensus in small groups.

 Since the first-year seminar is a student-centered course that focuses on the college experience, issues or dilemmas that relate directly to student experiences provide particularly relevant content for small-group work. The cases at the end of all chapters of the text have the potential to serve as focal points for small-group work. Also, debatable, open-ended questions that encourage divergent thinking and diverse perspective-taking can be a very effective stimulus for group work. For example, the following open-ended questions relating to the college experience may be used to effectively prompt HLT in small-group settings.

\* Should students be graded on a curve?

\* Should grades be abolished?

\* Should there be no required courses in college (only electives)?

\* Does competition or collaboration bring out the best in students?

\* What should the legal age be for drinking? (Or, should drinking be legal for anyone at

 any age?)

\* Is cheating ever justified?

\* Is college worth the cost?

\* How important should salary be in affecting a student’s choice of major and career?

\* How would you rank creativity, intelligence, or interpersonal skills in terms of their

 importance for professional success? For personal success?

\* How would you rank ability, drive, and luck in terms of their importance for personal success?

\* How important do you think physical attractiveness is for romantic relationships?

\* Would you say that men and women are more alike than different, or more different than

 alike?

\* What are your views about sex without love and love without sex?

\* Would you agree that it is better to have loved and lost than not to have loved at all?

The stimulus or focal point for group work could also be larger, societal or global issues, such as contemporary moral issues involving stem-cell research, animal studies, euthanasia, war, gun control, cloning, etc. The catalog description of any contemporary moral issues course offered on your campus should provide potential topics for promoting HLT in small groups. Also, asking faculty for controversial issues in their disciplines may also serve to get faculty involved with the seminar, which may increase their enthusiasm for the course and their support of it.

**The *Process* of Small-Group Work: Higher-Level Thinking *Procedures* or *Formats***

 The procedures and formats for group work that we are about to describe are not tied to any particular content area or course concept; they can be applied across subject areas. the procedures are explicitly spelled out in step-by-step fashion, but they are essentially “content-free” and may be transferred or applied to any topic you’d like your students to discuss in small-group settings.

 The sizablenumberof small-group formats that follows is not intended to overwhelm you with a dizzying or paralyzing array of possible choices. Instead, the large quantity is intended to provide you with multiple options and allow you freedom to “pick and choose” those procedures that best meet your instructional needs.

 The names used to describe the following procedures are those that were coined by their originators. Naming or labeling group-learning formats makes it easier to organize them and communicate their procedural steps to students. We recommend keeping the name of the procedure and its steps in full view of students while they work through the group task (e.g., project the steps on a slide or transparency) so students can see what they are supposed to do at each and every step in the process.

**“Reciprocal Peer Questioning”**

Steps:

1. Students listen to a presentation (your own or that of a guest speaker) and generate 2-3 relevant questions pertaining to the presentation, using question stems designed to elicit higher-level thinking responses (such as those provided on pp.200-201 in the text).

2. Form two-member groups. One member poses a higher-level thinking question about the presentation; the other member adopts the role of explainer/respondent and attempts to respond to their partner’s question.

3. Students reverse roles, and the respondent become the questioner who uses a different set of question stems designed to elicit a different form or dimension of higher-level thinking with respect to the presentation.

Note: Research demonstrates that students can effectively learn to apply HLT question stems to ask and answer higher-level thinking questions on different topics and concepts (King, 1990). Furthermore, students who engage in this reciprocal peer question-and-answering interaction are more likely to ask higher-level thinking questions in subsequent group discussions and demonstrate higher-level thinking on course examinations (King, 1995).

The following small-group strategies are designed to promote *BALANCED THINKING*. They are intentionally constructed to encourage students listen carefully, and thoughtfully consider arguments on both sides of a controversial issue.

***Pro-&-Con Grids***

1. Form 3 or 4-member teams. Ask the teams to examine both the pros and cons of a particular idea or strategy, and have them record their ideas in a grid-like format (Angelo & Cross, 1993).

2. Ask one member from each team to report the pros, and have a different team member report the cons.

3. List both pros and cons on the board as they are reported.

4. After all the cons have been listed, ask groups to brainstorm strategies for converting the list of “cons” into “pros.”

5. Finally, conduct a plenary discussion during which students note the conversion strategies generated by different teams.

***Forced Debate***

Steps:

1. All students who agree with a proposition sit on one side of the room and all who disagree with that proposition sit on the opposite side.

2. Form 3- or 4-member teams among students who find themselves on the same side of the room

3. Unexpectedly “force” students to argue for the position opposite to the one they chose (Kalish, 1996).

***Timed Pair-Share***

Steps:

1. Pair students who hold different views on a particular issue.

2. One member shares her ideas for a designated amount of time (e.g., one minute) while the partner listens and records her main ideas.

3. Partners reverse roles and follow the same procedure for the same amount of time (Kagan & Kagan, 1998).

***Paraphrase Passport***

Steps:

Same as the above “Timed Pair-Share” procedure; the only differences are: (a) it uses 3- or 4-member groups, and (b) before teammates can contribute any ideas of their own, they must *paraphrase or restate* the idea of the teammate who has just spoken.

***Affirmation Passport***

 Same steps as the above “Paraphrase Passport” procedures, except that each teammate is expected to *affirm* something about the comment made by the previous student (e.g., its clarity, creativity, or most persuasive point) before contributing his own idea (Kagan, 1992).

***Response Gambits***

 This procedure involves the same steps as *Paraphrase Passport*, except that each team member provides a response to the previous teammate’s contribution before being allowed to share her own idea. To facilitate responses to their teammates, students are given response stems or sentence starters, such as: “One thing I learned from your contribution was . . .” or, “Tell me more about . . . .” (Kagan & Kagan, 1997).

Note: The HLT questions stems on pp. 181-82 of the text may be used as response stems or sentence starters for this procedure.

***Constructive Controversy*** (a.k.a., ***“Structured Controversy”***)

Steps:

1. Form 4-member teams.

2. Have the quartet divide into two pairs and give them an assignment in which they generate ideas to support one side of a controversial issue.

3. After the pairs complete their work, each pair presents the evidence or arguments it has gathered for its assigned side of the issue. (The purpose of this evidence sharing is to marshal all available evidence in support of the position—not to “defeat” the opposing position.)

4. After each pair presents its information on their assigned side of the issue, the pairs switch sides to research and develop further arguments for the position opposite to the one they initially endorsed.

5. Finally, all four teammates generate a compilation of the best arguments for both positions (Johnson, Johnson, & Smith, 1993).

The following group strategies are designed to promote the taking of

*MULTIPLE PERSPECTIVES.*

The procedures cited in this section are designed to create heterogeneous teams whose members hold differing viewpoints, thereby exposing students to diverse perspectives that can often provide the stimulus for cognitive growth and attitude change. The following procedures should be introduced with instructions to students that clearly articulate the reasoning behind their own perspectives and to listen carefully to the reasoning that lies behind the perspectives of others. An additional step could be added to any of the following procedures, which asks group members to (a) identify the root causes for their disagreement and (b) brainstorm strategies for reducing the gap between their differing positions.

***Corners***

Steps:

1. Students move to one corner of the room based on a personal choice, position, or stance on a particular issue.For instance, students may move to a corner of the room that represents their level of agreement with respect to a particular issue or statement (strongly agree – agree – disagree – strongly disagree).

2. Form 4-member teams by taking a pair of students from two different corners of the room (i.e., students holding different positions).

3. Within these four-member groups, have the two students who hold the same viewpoint pair-up and share their best arguments.

4. Have both pairs take turns listening to each other’s arguments.

5. Finally, have all four students work together to create a final product that represents the best arguments for both sides of the issue.

***Value Line***

Steps:

1. Students form a human line across the room, taking a *position* on that line that corresponds to where they stand with respect to a statement or a controversial issue (e.g., personal ownership of guns should be banned). The line represents a scale (e.g., 1-10) with the far left (1) representing strong endorsement of the position and far right (10) representing strong opposition to the position. Thus, the line serves as an opinion spectrum that visually depicts the range of student positions on the issue at hand, and shows students where they stand conceptually (and literally) on the issue relative to their peers.

2. From this rank-ordered line, heterogeneous four-member teams may be formed by asking students on opposite ends of the line to join together—a procedure referred to as a “*folded value line*”—which results in the creation of teams comprised of two students who most strongly *agree* with the statement and two students who most strongly *disagree* with it.

 Note: A *“split value line”* procedure may also be used for step 2, whereby the value line is split in half, at the middle, creating two separate lines. These two lines can then be slid together in such a fashion that students occupying a middle position—who are likely to hold a balanced viewpoint that reflects appreciation of both sides of the issue, are teamed with students occupying the end positions—who hold a more polarized perspective and are more likely to view the issue in black-and-white terms (Kagan, 1992). For example, two students representing extreme positions (e.g., positions #1 and #20 in a class of 20 students) join up with two students who hold middle-ground positions (e.g., positions #10 & 11). Then students in positions #2, 9, 12 and 19 etc. are grouped until all students on the value line have been assigned to a heterogeneous team.

3. Groups then identify evidence or specific incidents that support their different perceptions, and they collaborate to brainstorm strategies for bringing their discrepant viewpoints closer in line.

***Talking Chips***

Steps:

1. Create 3- or 4-member teams of students who hold different viewpoints on an issue and give each team member a symbolic “talking chip” (e.g., a checker, coin, or pen).

2. Each teammate is instructed to place the chip in the center of the team’s workspace when he or she makes an individual verbal contribution to the team’s discussion.

3. Teammates can speak in any order, but they cannot speak again until all chips are in the center—an indication that every team member has spoken.

4. After all chips have been placed in the center, team members retrieve their respective chips for a second round of discussion—which follows the same rules of equal participation (Kagan, 1992).

***Response Mode Chips***

 Same steps as *Talking Chips* except that teammates use different-labeled or colored chips that signify different types of responses to their teammates—e.g., a “continue brainstorming” chip, a “summarizing” chip, or an “evaluation” chip (Kagan & Kagan, 1998).

 Note: The chips could also be designated as representing different forms of higher-level thinking questions by using the question stems on pp. 181-182.

The following group strategies are designed to promote *ANALYSIS*.

***Advertising Analysis Groups***

1. Bring to class (or ask your student to bring to class) advertisements designed to persuade the public to purchase particular products.

2. Create “pair-share” groups in which two students team-up to share their thoughts about what underlying persuasive messages or strategies are being used in the advertisements.

3. Have each pair join another pair to create 4-member groups (“pairs square”) who compare their respective analyses, noting similarities and differences in their interpretations.

***Three-Stray, One-Stay***

Steps:

1. Form groups of four students and have them generate their ideas with respect to a particular issue, dilemma, or problem.

2. Ask three members of the team to stray (rotate) to an adjacent group while one student stays seated to explain the ideas that appear on his team’s product to the three rotating “strays” from another team.

3. After the straying students return to their home team, a second teammate stays back while the other three rotate two teams ahead.

4. The third teammate stays back while the others rotate three teams ahead.

5. Finally, the fourth teammate stays back while the other three rotate four teams ahead.

(When this four-step rotation is complete, each team member will have seen three different products generated by three other teams.)

6. Teammates reconvene to conduct a *comparative analysis* of the differences and similarities among the products they’ve observed and use this information to improve their home team’s final product. (Kagan, 1992; Millis & Cottell, 1998).

***Half-Stay, Half-Stray***

 Same steps as *Three Stray, One Stay*, except that a *pair* of teammates from the home teamstaysto receive a pair of strays from another team, while the otherpair straysfrom the home team to visit with a pair from another team (Cuseo, 2000).

The following group strategies are designed to promote *SYNTHESIS*.

***Unstructured Sorts***

Steps:

1. Form 3- or 4-member teams.

2. Working individually, students generate ideas on separate slips of paper or index cards.

3. All ideas are laid out on a table so that they can be read by all teammates.

4. Teammates work together to sort their separately brainstormed ideas into conceptually similar categories, noting the number or frequency of responses in each category.

(Kagan, 1992).

***Team Statement***

 Same steps as *Unstructured Sorts*, except that the group synthesizes their brainstormed ideas into a *team statement*, which attempts to integrate individual ideas into a coherent narrative sentence or paragraph. To do this effectively, students may need to be informed that a team statement is not simply an add-on list or run-on sentence, but a narrative composite that best summarizes and connects each teammate’s main ideas (Cuseo, 2000).

 Note: Instead of a team sentence, students may be asked to generate a team phrase or team word, whereby their group attempts to capture the essence of all their ideas in a single phrase or word—sometimes referred to as a “word journal.”

***Affinity Diagram***

A procedure similar to *Unstructured Sorts*, which involves the following steps:

1. Team membersthink individually about possible solutions to a problem and record their ideas on separate Post-It notes.

2. After members run out of ideas, all their individual solutions are posted across a blank wall or on a large piece of paper.

3. Teammates then work collectively to synthesize the group’s main ideas by grouping their individually-generated ideas into a “master list,” consisting of categories and subcategories (Ray, 1994).

***Cooperative Concept Mapping***

Steps:

1. Form 3- or 4-member teams and ask them to brainstorm ideas on a particular problem or issue..

2. Teammates first work individually, either inside or outside of class, to construct “concept maps” that capture their ideas, and the relationships among them, in different *nodes* (boxes or circles) connected by specific *links*—which indicate the nature of the relationships between concepts. (The concept map depicted on p. 152 of the text may be used to illustrate this mapping process.)

3. Teammates reunite to compare their separately constructed maps, and attempt to synthesize them into one global, “team map” (Abrami, 1995).

***Jigsaw***

Steps:

1. Form 3 or 4-member teams and ask have each teammate assume responsibility for becoming an “expert” on one perspective or dimension of an issue (e.g., a cultural perspective or a dimension of holistic development).

2. Members leave their respective teams to join members of other teams who are also “experts” on the same subtopic.

3. After meeting in different expert groups, students return to their home team and teach their individual area of expertise to their teammates.

4. Lastly, students attempt to “piece together” or connect their specialized perspectives to form a finished product (akin to completing a “jigsaw” puzzle). (Aronson, et al., 1978).

Note: This procedure may be modified so that each teammate assumes a different *higher-level thinking role* (e.g., analysis, synthesis, evaluation, balance) with respect to the concept or issue under investigation. These roles may be depicted visually for students in the form of a graphic organizer, such as the *content-by-process matrix* depicted below, which juxtaposes key higher-level thinking processes with key course concepts. (Matrices, grids, rubrics, and checklists are often effective ways to visually integrate and track multiple processes, particularly when these processes are tacit or “invisible”—such as thought processes.)

 **TOPIC/ISSUE**

 (Learning Task)

 Concept Concept Concept

 1 2 3

 ╔════════╤═════════╤═════════╗

 Analysis ║ │ │ ║

 ╟────────┼─────────┼─────────╢

 Synthesis ║ │ │ ║

 **HLT PROCESSES** ╟────────┼─────────┼─────────╢

(Student Roles) Evaluation ║ │ │ ║

 ╟────────┼─────────┼─────────╢

 Balance ║ │ │ ║

 ╚════════╧═════════╧═════════╝

To ensure that students expand their repertoire of thinking skills, teammates could be asked to *rotate* their thinking roles on successive small-group tasks.

***Co-op Co-op***

Steps:

1. Students engage in a class discussion about an issue and identify key dimensions or perspectives they think are involved in its cause or solution.

2. Different 4-member teams are formed to address each of the key dimensions or perspectives that have been identified.

3. Within each team, students divide their work and individual teammates become experts with respect to the dimension they have chosen.

4. The experts research their different components individually and present the results of their findings to their team.

5. The team synthesizes their individually-completed reports into a comprehensive product and makes a group presentation on this product to the entire class, using whatever presentation format they prefer (e.g., oral, written, audio-visual, or multi-modal)(Kagan, 1985).

***Co-op Jigsaw***

The first three steps in this procedure are identical to *Co-op Co-op*, but steps 4-6 differ as follows:

4. Each team’s expert meets with experts from other teams who are specializing on the same dimension or perspective.

5. After discussing their specialized component in their expert groups, the expert groups make presentations to the entire class.

6. Lastly, experts return to their home teams and integrate their separate work into a unified team product (Kagan, 1985).

***Representative Reporting Groups***

Steps:

1. Form 3-4 member teams of students who hold similar views on a position, and ask the teams to generate their best arguments.

2. Ask, or randomly select, one representative from each group to share the team’s ideas as part of a panel of representative reporters—who occupy seats at the front of class.

3. Include a chair at the front of the room for you to serve as panel moderator, whose role is to keeps the panel dialogue flowing and highlight key differences and recurrent themes expressed by the student panelists. Include a second chair for any student not on the panel who would like to come up and ask a question or request clarification on the ideas presented by the panelists (Abrami, 1995).

Note: Panelists may be allowed to seek input or assistance by “calling a friend” (teammate), thus allowing this procedure to simulate the TV game show, *Who Wants to be a Millionaire*

The following group strategies are designed to promote *CREATIVE THINKING*.

***The Whip***

Steps:

1. Form 3- or 4-member teams and ask them to sit in a small circle.

2. While seated in circles, one member of the group uses a word or phrase to quickly share her first thought on how to solve a problem or resolve an issue that you’ve posed to them.

3. Other teammates follow by sharing their word or phrase in rapid-fire fashion, i.e., they continue to “whip” around their group’s circle until they run out of solutions.

***Carousel Brainstorming***

Steps:

1. Three- or four-member teams are given different colored magic markers and a poster on which to record ideas in response to a specific issue or dilemma.

2. After completing their work, teams rotate clockwise to another team’s poster, adding a different idea to each poster—being sure not to duplicate what another team has already written (Millis, Sherman, & Cottell, 1993).

***Blackboard Share***

Steps:

1. Working in 3- or 4-member teams, students generate ideas with respect to the same topic or issue; as each new idea is generated, a member of the team goes to the front of the room to post it.

2. As teams generate a new idea that’s not posted, a different team member goes to the board to post it (Kagan & Kagan, 1998).

Note: This procedure enables teams to work both independently and interdependently by allowing students to use ideas produced by other teams while simultaneously working on their own ideas. This interchange can increase energy within teams and create synergy across teams as they piggy-back on each other’s ideas.

***Stand & Share***

Steps:

1. Three- or four-member groups generate ideas relating to a problem or issue.

2. After completing their group work, a member from each group successively stands and shares one idea generated by her team. Other teams check it off if they already produced the same idea, or add it to their list if they hadn’t thought of it.

3. After the first team member reads an idea, the list is passed to a teammate who reads another idea. This process continues until all items on a team’s list have been shared. The team then sits down, and using the same reporting format, a new team stands and shares any ideas their team generated that were not already mentioned,

4. The rotational process continues until all unique or distinctive ideas generated by each team have been reported to the entire class (Kagan, 1992).

***Team Stand & Share***

 Similar to *Stand and Share*, except that the entire team stands, and after one of its members reports an idea, the list is passed to another team member who reports a different idea. This process continues until all items on a team’s list have been shared. The team then sits down, and a new team stands and shares an idea that has not been mentioned.

 Note: A more active version of *Team Stand & Share* can be created by having each team deliver only one of its ideas before the next team stands to share an idea. This serves to get groups up from their chairs in rapid fashion, which lends more physical energy to the reporting process, simulating the “wave” created by fans at sporting events (Cuseo, 2000).

***Rotating Review***

Steps:

1. The instructor writes one problem or issue atop separate pieces of chart paper and posts them around the room.

2. Three- or four-member teams are formed.

3. Each team stands in front of one of the charts is given one minute to record as many ideas as they can on that topic before rotating to the next topic (chart).

4. When teams rotate to the next topic, they have two minutes to read, discuss, and take notes on the ideas written by the previous team, after which they’re given one minute to write additional information before rotating to the next topic.

5. This process continues until all teams rotate back to the first topic they encountered (Kagan (1992).

***Gallery Tour***

Steps:

1. Have 3- or 4-member teams first complete a product that represents their collective

thoughts on an issue—for example, a chart, poster, concept map, or artistic depiction.

Explicitly encourage the teams to represent the products of their thinking in creative ways. The variety of group products that are generated can often illustrate poignantly to students how creativity is enhanced by collaboration and teamwork (Millis & Cottell, 1998).

2. Have students rotate around the room to view the completed products of other teams before returning to their own team product to incorporate any new ideas they acquired during the tour.

Note: To expedite this procedure, teammates can be asked to split up, with different members going to view different products before reconvening to share the information they gleaned on their separate tours (Kagan & Kagan, 1998).

***Conference Poster Session***

 Same steps as the *Gallery Tour* except that one or two members of the team remain by their own team-posted product to explicate or elaborate on its content for touring teams that come to view it (Cuseo, 2000).

***Rotational Graffiti***

Steps:

1. The instructor writes a different topic or issue atop separate pieces of chart paper and distributes each of them to different 3- or 4-member teams.

2. In response to the topic on their sheet, teammates simultaneously write “graffiti” (i.e., reactions, interpretations, or free associations on them) for a designated period of time, after which they rotate their sheets clockwise to another team that adds its own graffiti on the topic—without looking at the ideas that were already recorded.

3. The rotational procedure continues until each team receives back the sheet (topic) they started with, thus ensuring that all teams have written graffiti on all topics.

4. Finally, each team works independently to integrate or categorize the ideas expressed by different teams on their particular topic and presents their summaryto the entire class (Abrami, 1995).

***Cooperative Graffiti***

Steps:

1. Form 3- or 4-member teams.

2. Give each team one large, butcher-block sized piece of paper on which each teammateindividuallyrecords as many ideas as possible—using different colored pens.

3. After completing their individual brainstorming, teammates work together and attempt to organize their multi-colored collage of ideas into meaningful categories (Abrami, 1995).

***Roundtable***

Steps:

1. Form 3- or 4-member teams and provide them with a single pen and a single piece of paper or transparency.

2. One teammate records a contribution on the paper and then passes the paper and pen on to another teammate who does the same.

3. The paper and pen are passed progressively around the table until all team members have recorded an idea (Kagan, 1992).

***Roundrobin***

 Same steps as *Roundtable* except that students’ individual contributions are expressed *orally*, rather than in writing (Kagan, 1992).

***Simultaneous Roundtable***

 Same steps as *Roundtable* except that two or more large, butcher-block sized papers, each of which with a heading relating to a different topic (e.g., three papers relating to three different perspectives or theories), are passed around the table simultaneously and each team member records an idea on the paper before passing it on to an adjacent teammate (Kagan & Kagan, 1998).

The following group strategies are designed to promote *CRITICAL THINKING (Evaluative Judgment)*

***Carousel Feedback***

Steps:

1. Form 3- or 4-member teams; provide them with different colored magic markers and a poster on which they record their ideas in response to a specific issue or dilemma.

2. After completing their work, teams rotate clockwise to view other teams’ products and comment on the product, using a feedback sheet that is posted nearby (Kagan, 1998).

***Product Rotation***

Steps:

1. Form 3- or 4-member teams; have them generate ideas with respect to a topic or issue, and record their ideas on paper.

2. After a designated period of time, each team passes its product clockwise to another team while simultaneously receiving and critically reviewing a product from an adjacent team—using evaluative criteria provided by the instructor (e.g., relating to the product’s creativity, validity, clarity, or practicality).

3. The rotational process continues until all teams’ original product is returned to them (Cuseo, 2000).

***Nominal Group Technique*** (***NGT***)

Steps:

1. Three- or four-member groups generate ideas individually (e.g., possible solutions to a roblem) and record their ideas on an index card.

2. Individual members pass their completed cards clockwise and receive a completed card from an adjacent teammate, noting any ideas they didn’t include on their own list. This rotational process continues until each member receives back his or her original set of ideas.

3. Each member adds to their own completed card any ideas gathered from their teammates’ cards and attempts to prioritize the ideas with respect to a particular criterion (e.g., importance, practicality, and viability—i.e., probability of being implemented).

4. The group reconvenes; teammates share their list of prioritized ideas, looking for patterns of agreement or disagreement in their order of priority, and attempts to reach consensus about what idea should be given highest priority.

***Send-a-Problem***

Steps:

1. Form 3-4 member teams.

2. Pose different problems or issues on the board, a flip chart, or screen.

3. Have each team select a different problem or issue to address.

4. Each team brainstorms as many solutions as possible to the problem and records their solutions on a sheet of paper that’s placed inside a folder.

5. After a designated period of time, the folder is passed on to another team who, upon seeing the particular problem written on the outside of the folder, begins to generate as many solutions as possible—without opening the folder to look at solutions generated by the previous team.

6. The folders are passed onto a third team that reviews the solutions proposed by the previous two teams and attempts to reach consensus on what were the most effective solutions generated by the two teams (Millis, 1997).

***Group Prioritizing of Guest-Speaker Questions***

1. During the class session before a guest speaker’s presentation, have all students prepare questions for the speaker individually.

2. Form 3- or 4-member groups. Ask the groups to evaluate the questions prepared by its individual members and reach consensus with respect to what question should receive the highest priority.

3. Ask the groups to select or elect a representative whose task will be to ask their group’s highest-priority question when the speaker comes to class.

4. On the day of the guest speaker’s presentation, have students rejoin their groups and give their representative an opportunity to ask their group’s top-priority question (Cuseo, 2000).

Additional Material for Possible Use in Lectures or Reading Assignments Excised from the First Edition of the Textbook

What Is Thinking?

“Thinking” refers to the mental process of consciously experiencing thoughts, ideas, and images. Psychologists often refer to thinking as “cognition” or as “cognitive” activity (from “cogito,” meaning “to think” or “to know”), and distinguish it from emotions (e.g., anger or anxiety) or drives (e.g., hunger or sex). Brain research confirms that thought and consciousness occur in the upper part of the brain, nearer its outer surface, whereas emotions and drives originate from deep within the middle area of the brain (LeDoux, 1996).

"Cogito ergo sum"
(“I think therefore I am.”)

—René Descartes, 17th-century French philosopher and mathematician

The ability to think at higher levels is a key characteristic that distinguishes human beings from other living creatures. When the human brain is compared to the brains of other animals, it is clear that the area that is most responsible for higher thinking—the frontal lobe—is much larger in humans than other animals. This gives humans a distinctive biological advantage in intelligence and enables us to think at higher levels than any other living species.

Some scholars argue that it is the presence of thinking that defines a “living” or an “alive” human being. In contrast, prolonged absence of any electrical activity (flat line) in the upper parts of the human brain that are responsible for conscious awareness and thinking is referred to as “cerebral brain death.”

Multidimensional Thinking

**Systems Thinking**

Reaching conclusions and making decisions that are both accurate and effective requires use of what some scholars call “systems thinking”—taking into account how our decisions affect and are affected by other parts of a larger, interrelated system (Senge, 1990). Systems thinking highlights the importance of viewing issues from multiple perspectives, such as those contained in the lists we have just provided. It is unlikely that you will need to consider all the perspectives on these lists for each issue you study or discuss. Issues you examine in college will probably have implications for some of these perspectives and not for others. It is best to use the four lists of perspectives as checklists; they can be easily scanned to check for perspectives that relate to the issue you’re examining and to identify whether an important perspective has been overlooked in your thinking, or in the thinking of others.

Considering Multiple Theories

In addition to taking multiple perspectives, multidimensional thinking also involves considering multiple theories. A *theory* may be defined as a body of related concepts and general principles that help us organize, understand, and apply knowledge that has been acquired in a particular field of study. For example, in Chapter 4 we used information-processing theory to organize a large amount of research in the field of learning and memory, so that we could deliver it to you in a form that was connected and coherent, rather than random and piecemeal. Information-processing theory helps us understand the concepts of learning and memory by explaining it in terms of a three-stage process (input, storage, and retrieval) similar to that used by a computer. We also used this theory to generate a series of practical strategies that could be applied to improve academic performance.

One major misconception about a theory is that it’s impractical. When people hear the word “theoretical,” they often interpret it as being the opposite of practical, and they mistakenly conclude that a theory has no practical use, value, or benefit. However, theories do have practical benefits; they help us organize and make sense of research so that we can apply its results to improve the quality of our lives (for example, information-processing theory can improve the quality of our learning and memory).

 “Nothing is more practical than a good theory.”

 —Kurt Lewin, social psychologist, and first well-known authority on group dynamics

Another common misconception about a theory is that it’s nothing more than an opinion or guess. However, scholars in an academic field will not call something a theory until its ideas have been supported by at least some evidence. Don’t confuse theory—which is supported by some evidence, with a *hypothesis*—which is an informed guess that *might* be true, but still needs to be tested to confirm whether it *is* true.

Although theories are supported by evidence, no single theory can account for the whole truth or tell the whole story. This is why more than one theory exists in virtually every field of study. Different theories explain different portions of the total truth or knowledge that exists in any given field. For instance, information-processing theory alone cannot explain all aspects of human learning and memory. This theory is based on a computer model, and since computers do not experience emotions or feelings, it does not adequately account for the influence of motivation on human learning—for example, how humans often learn information more quickly and retain it longer if they’re excited about it or interested in it. So, we also need to consider another theory (motivational theory) to account for how human interest and motivation affects learning and memory.

While no single theory can account for the whole truth, the good news is that elements of different theories may be combined to explain a larger portion of the total truth. Also, elements of different theories may be combined to give us a more complete and versatile set of tools to use for practical purposes. For example, in Chapters 4 and 5, we were able to generate a wide variety of strategies for improving learning and memory by combining elements of the following theories:

l information-processing theory—e.g., strategies for creating memory cues to retrieve stored information,

l brain-based learning theory—e.g., strategies for using the left and right halves of the brain to record dual (verbal and visual) memory traces, and

l constructivist learning theory (which takes the position that we learn by constructing or building new knowledge on what we already know)—e.g., strategies for using analogies and metaphors that relate what we’re trying to learn to what we already know.

If you find yourself thinking or asking the question, “Why do we need all these theories anyway?” keep in mind that scholars in different fields are attempting to understand, explain, and improve the human experience and the world around us. These are not simple, one-dimensional subjects; they are complex, multi-dimensional subjects that involve many factors and perspectives. Multiple theories are needed to understand the multiple factors and perspectives, and to help us develop a more comprehensive set of strategies for improving the human and world condition.

**Dialectical (Dialogic) Thinking**

Don’t be surprised if you find that scholars in the same field disagree about what particular theory accounts for the largest portion of “truth” in their field. Don’t be frustrated by such disagreement; it’s part of the normal process of intellectual dialogue that gradually brings us closer to a more complete understanding of the issues and questions in any field of study. This thought process is referred to as *dialectical* or *dialogic thinking* (Paul & Elder, 2002) (from the root word meaning “conversation”). When you think dialectically, you consider opposing viewpoints—a *thesis* and an *antithesis*; then you engage in an exchange of arguments for and against each viewpoint. During this dialogue, the thesis and antithesis are cross-examined and tested for their strengths and weaknesses. This process of cross-examination gradually leads to a *synthesis*—an integrated and intermediate viewpoint, which is closer to the truth than either the thesis or antithesis.

Dialectical thinking stimulates and sharpens our thinking skills by forcing the mind to consider the strengths of opposing viewpoints simultaneously, creating a mental experience called cognitive *dissonance—*a state of mental contradiction or disequilibrium (Kurfiss, 1988; Meyers, 1986). When you consider the strengths of opposing positions at the same time, it reduces *dualistic* thinking—an oversimplified form of thinking in which “truth” is seen as something that is always clear-cut and black-or-white, with one answer or position being right and all the others wrong (Perry, 1970, 1999). Thus, your first step in the process of seeking truth is not to immediately jump in and look to take an either-or (for-or-against) stance on a debatable issue. Instead, your first step should be to look at the pros and cons of each position, acknowledge the strengths and weaknesses of each, and identify what additional information may still be needed to reach a conclusion.

Studies consistently show that the majority of first-year college students think in a *dualistic* (black-white) manner, believing their professors’ role is to give them the correct answers and their role is to learn (or memorize) these answers (Baxter-Magolda, 1992; Belenky, et al., 1986; King & Kitchener, 1994). However, in college (and in reality), truth often does not come in the form of absolutes that are either true or false and conveniently packaged in boxes that are marked “right” or “wrong.” This is not to say that there are “only opinions,” “everybody has a right to their own opinion,” or “it’ all relative.” What it does say is that although there may not be one absolutely correct answer, there are still some answers that are better than others because they are more accurate; and some viewpoints are better than others because they are better *informed*—that is to say, they are based on more accurate information or stronger evidence. Thus, answers are usually not either black (wrong) or white (right) but come in different shades of gray, ranging from lighter to darker, with some answers being closer to the truth than others because they are better supported by reason and evidence.

“The trouble with English is that there are no answers. There are only evaluations and critical judgments backed up with evidence and strong argument. It requires the ability to make a case through reasoned, logical argument, and the ability to marshal evidence.”

 —English professor (quoted in Donald, 2002, p. 1)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Remember:** a theory is that not just an opinion or guess. Scholars in an academic field will not call something a theory until its ideas have been supported by a sufficient amount of evidence. Don’t confuse theory (which is supported by evidence) with a *hypothesis*—which is an informed guess that *might* be true, but still needs to be tested for evidence that it *is* true.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Although theories are supported by evidence, no single theory can account for the whole truth or tell

the whole story. This is why more than one theory exists in virtually every field of study. Different

theories are needed to explain different portions of the total knowledge that exists in any field of

study.

If you find yourself thinking or asking the question, “Why do we need all these theories anyway?” keep in mind that scholars in different fields are attempting to understand, explain, and improve the human experience and the world around us. These are not simple, one-dimensional subjects; they are complex, multi-dimensional subjects that involve many factors and perspectives. Multiple theories are needed to understand the multiple factors to help us develop a more comprehensive understanding and set of strategies for improving the human and world condition.

When you encounter multiple theories in college, try not to look at them in dualistic (right-or-wrong) terms. Instead, take an *eclectic* approach, which means that you are open to different theories, willing to borrow elements from each of them in order to create a more comprehensive understanding of complex issues, and ready to acquire a wider variety of tools for solving practical problems.

Inferential Reasoning

Inferential reasoning takes place through either of two routes:

1. Deductive reasoning (deduction) or

2. Inductivereasoning (induction).

Since these are the primary ways that humans make arguments and reach conclusions, we will take a close look at both of these forms of inferential reasoning.

Deductive Reasoning (Deduction)

When we reason *deductively*, we start with a general statement (the premise); we then infer (step to) a conclusion about a specific instance or particular case by arguing that it follows logically from the general premise. A clear-cut example of deductive reasoning is the *syllogism*—a formal argument that involves a major premise, a minor premise, and a conclusion, such as the following:

All college students like pizza. (Major premise)

Greg is a college student. (Minor premise)

Therefore, Greg likes pizza. (Conclusion)

Notice that this argument starts with a general statement (about college students and pizza), then proceeds to a conclusion about a more specific instance or example (Greg).

When you deduce a conclusion, your logic flows from top to bottom—in other words, it trickles down from a general premise and steps down to infer a conclusion about something more specific. Deduction derives from the same root as the word “deduct,” which means to “take away” or “reduce”; thus, deductive reasoning takes from something larger (general premise) to reach a conclusion bout something smaller (a specific instance or example).

Inductive Reasoning (Induction)

When we reason *inductively*, we start with anobservation of a specific instance or case (the premise); we then infer a conclusion that consists of a general statement by arguing that the conclusion follows logically from the specific instance. Here is an example of inductive reasoning that will allow us to compare and contrast it with deductive reasoning:

I questioned fifty college students and found that each of them likes pizza. (Observation of specific instances)

Therefore, all college students like pizza. (Conclusion)

Notice that this argument starts with a specific observation (individual college students and pizza), and proceeds to a conclusion about something more general (all college students
and pizza). Thus, inductive reasoning moves in a direction that’s opposite to deductive reasoning. When you induce a conclusion, your logic flows from bottom to top—in other words, it bubbles up to a more general conclusion by taking an inferential step up from individual instances or specific examples. Induction derives from the same root word as “induct,” meaning to “take into.” Just as an individual can be inducted or taken into a larger group (e.g., an honor society or the hall of fame), inductive reasoning involves taking an individual instance to reach a larger (more general) conclusion.

Both deductive and inductive reasoning are important forms of higher-level thinking because they represent the primary mental processes humans use to reach conclusions about themselves and the world around them. These are also the two key thought processes that you will use to make arguments and reach conclusions about ideas presented in your college courses. For example, in an art history class, you may be asked to provide specific examples of artwork that represent the same general artistic style; this mental process requires deductive reasoning. Or, you may be shown specific works of art and asked to identify what general style or form of art that each of these instances represent; this mental process requires inductive reasoning.

Using Critical Thinking to Evaluate Deductive Reasoning

When critical thinking is used to evaluate arguments that involve deductive reasoning, two key elements of the argument require careful judgment:

1. Is the premise true? (In other words: Does the argument begin with and build on a statement that is accurate?)

2. Is the conclusion logically consistent with the premise? (In other words: Does the conclusion logically follow or flow from the premise?)

For example, let’s apply critical thinking to evaluate the deductive reasoning used in the following argument.

Mind-altering drugs are harmful to you. (Major premise)

Alcohol is a mind-altering drug. (Minor premise)

Therefore, alcohol is harmful to you. (Conclusion)

In this argument, there are two premises that may not be true:

1. The major premise states, “Mind-altering drugs are harmful to you.” This is not necessarily true, because taking mind-altering drugs may not be harmful to someone who is experiencing extreme physical pain (e.g., morphine given to a patient who has just recovered from a major operation), or for someone experiencing extreme emotional pain (e.g., giving an anti-depressant drug to someone who’s extremely depressed and suicidal, due to a chemical imbalance in the brain).

2. The minor premise that alcohol is a mind-altering drug is not true in all cases. It is a mind-altering drug if taken in sufficiently large doses; however, if taken in small doses, alcohol may be classified as a beverage (e.g., drinking a glass of wine with dinner). So, a critical thinker would judge the quality of this argument to be weak because its conclusion is built on weak premises.

Now, let’s apply critical thinking to evaluate a second key element of deductive reasoning: whether an argument’s conclusion is logically consistent with its premises. Consider the following argument:

Alcohol is a dangerous drug because it increases the rate of violent and sexual crimes committed in our society. (Premise)

During the prohibition, drinking alcohol was illegal and people still continued to make alcohol illegally and abuse it. (Premise)

This proves that alcohol is a dangerous drug that should be banned. (Conclusion)

In this argument, both of the premises are true. Studies do show that drinking alcohol does increase the rate of violent and sexual crimes (e.g., date rape). The second premise is also true: During prohibition, people did continue to make alcohol and get drunk. However, the conclusion that alcohol should be banned does not follow logically from the second premise. If alcohol was banned during the prohibition and people still used and abused it, why would there be any reason to conclude that banning it now would provide a solution to the problem? (In fact, it could be argued that it would make the problem worse because prohibition led to the birth and growth of organized crime groups whose booming illegal business was the selling of illegal or “bootleg” alcohol.) Thus, critical thinking would lead us to question this argument because its conclusion does not logically follow from one of its premises. (In the field of logic, this type of thinking error is referred to as a *non-sequitir*, which literally means: “It does not follow.”)

Using Critical Thinking to Evaluate Inductive Reasoning

When critical thinking is used to evaluate arguments that involve inductive reasoning, two different aspects of the argument require careful judgment:

1. Is the size of the sample large enough to make a generalized statement?

2. Is the sample representative—does it accurately reflect the characteristics of the larger group that’s referred to in its conclusion?

For example, let’s apply critical thinking to evaluate the quality of inductive reasoning used in the following argument.

My father drank alcohol and became an alcoholic. (Specific instance)

My uncle drank alcohol and became an alcoholic. (Specific instance)

Therefore, people should not drink alcohol. (General conclusion)

In this argument, the conclusion is based on just two instances or cases. Critical thinking would lead us to judge this argument as weak, because the number of cases or size of the sample on which it is based is too small to reach a conclusion about people in general. In the field of logic, this reasoning error is sometimes referred to as a *hasty generalization*.

Another criticism of the above argument is that its conclusion refers to people in general; however, the particular instances that have been observed (the two brothers), which form the basis of its conclusion, may not accurately represent or reflect people in general. Said in another way, the argument may be using apples to draw a conclusion about oranges. The two brothers have something in common (their genes), so it is very possible that they may share the same genetic tendency toward alcoholism because they share similar genes. Other people who are unrelated to these brothers are likely to have an entirely different set of genes; thus, it is questionable whether the two brothers can be used as a representative sample to reach the general conclusion that, “People (in general) should not drink alcohol.” In the field of logic, this type of “comparing apples to oranges” reasoning error is referred to as a *false* or *weak analogy.*

**Divergent and Convergent Thinking**

Creative and critical thinking often involve complementary mental processes, known as *divergent* and *convergent* thinking (Guilford, 1967). When you think creatively, you are using divergent thinking—that is, your thinking “diverges” (spreads out) in different directions, with the goal of generating many different possibilities. In contrast, when you think critically, you are using convergent thinking—that is, your thinking “converges” (narrows in) on each particular idea that you’ve created and evaluates it. In other words, creative thinking involves generating ideas that *could* be used; critical thinking involves determining which of these ideas *should* be used.

**Creative Thinking**

To think creatively doesn’t mean that you have to be an artistic genius. Creative thinking is not restricted to the arts; it can occur in all subject areas, even in fields that seek precision and definite answers. For example, in math, creative thinking may involve using new approaches or strategies for arriving at a correct solution to a problem. In science, creative thinking takes place when a scientist uses imaginative thinking to create a hypothesis or logical hunch (“What might happen if . . .?”), then conducts an experiment and collects evidence to test if the hypothesis turns out to be true.

**Creating Cognitive Dissonance**

To increase your ability to engage in balanced thinking, intentionally hold opposing ideas in your mind at the same time to put yourself in a mental state of cognitive dissonance.

Studies show that this type of cognitive contradiction or friction serves to decrease dualistic thinking and increase balanced thinking (Kurfiss, 1988; Meyers, 1986). Listed below are some specific strategies for creating cognitive dissonance.

l Find arguments for a position, then reverse your thinking and switch sidesto argue for the opposing viewpoint.

l When doing research on a controversial issue, proceed as if you are going to defend and refute both sides of the issue. For instance, seek out readings that take opposing viewpoints and compare or contrast them. This will enable you to develop and demonstrate balanced thinking in your assignments and discussions.

l During group discussions with classmates, seek out different viewpoints or positions.
For example, ask questions such as: “Who doesn’t agree with what’s being said?” or, “Would someone else like to express an opposing viewpoint?”

Studies show that the positive impact of interacting with peers on developing higher-level thinking skills is greatest when peers challenge each other’s beliefs, which promotes personal reflection and re-evaluation (Pascarella & Terenzini, 2005). Seeking out different ideas doesn’t mean that you are indecisive, looking to conform to someone else’s viewpoint, or that you want to be a “yes man” who always agrees with others. Nor does it mean that you don’t want to be a “no man” who always disagrees with others or ignores their viewpoints. Instead, you want to be an “open person” who seeks out and listens to different viewpoints in order to gain access to additional ideas that may make your viewpoint more balanced and complete.

By seeking out and discussing opposing viewpoints during group discussions, your group benefits by what social psychologists call the “group depolarization” effect—the tendency for each group member’s position to become less extreme (depolarized) as a result of being exposed to an alternative viewpoint (Taylor, Peplau, & Sears, 2006). This strategy is not only valuable for improving the balance and quality of your group discussions in college, but it will also improve the group discussions you’re likely to become involved in beyond college (e.g., committee work and jury duty).

 “I make progress by having people around who are smarter than I am—and listening to them. And I assume that everyone is

 smarter about something than I am.”

 —Henry Kaiser, successful industrialist, known as the “Father of American shipbuilding”

l During group discussion, periodically play the role of *devil’s advocate*—the person who points out the shortcomings or weaknesses in the position that everyone else seems to be taking. This will promote your group’s awareness of the limitations or disadvantages of its viewpoint, and will help them avoid what social psychologists call “group think”—the tendency for a tight-knit group of like-minded people whose thinking is so much alike that they become blind to its weaknesses (Janis, 1982). Even if you are persuaded by your group’s position, always be on the lookout to find and acknowledge its possible limitations or weaknesses.

**Remember:** The goal of group work is not to encourage rigid conformity or blind loyalty among its members, nor is it to discourage disagreement or dissent. As a responsible group member, one of your key roles is to encourage other members to express their individual viewpoints, even if they differ from the majority. If you are the person who holds a view that differs from other members, your role is to help your group seek *consensus*—which means one of three things:

1. you change your mind and agree with other members of your group,

2. group members change their minds and agree with you, or

3. you and other members of your group agree to disagree and move on with your work.



Benefits of Higher-Level Thinking

Higher-level thinking and research skills are increasingly important in today’s information age, in which increasing amounts of information are being produced at increasingly faster rates.

As futurologist John Naisbitt (1982) predicted in *Megatrends*, “Running out of [information] is not a problem, but drowning in it is” (p. 24). The tidal wave of factual information currently being produced cannot be simply remembered or memorized, and even if it could, most of it would soon become outdated and replaced by the next wave. Thus, acquiring factual knowledge is less important than developing:

l information-literacy skills—which will allow you to efficiently search for and find information that is most relevant to your needs, and

l critical thinking skills—which will enable you to evaluate and select only the best information from the overwhelming amount that’s at your fingertips (Cross, 1993).

The majority of new workers in the information age will no longer work with their hands but with their heads (Miller, 2003), and employers will value college graduates who have inquiring minds and possess higher-level thinking skills (Harvey, et al. 1997).

Higher-level thinking skills are vital for citizens in a democracy.

Authoritarian political systems, such as dictatorships and fascist regimes, suppress critical thought and demand submissive obedience to authority. In contrast, citizens living in a democracy are expected to control their political destiny by choosing (electing) their political leaders; thus, judging and choosing wisely is a crucial civic responsibility in a democratic nation. Citizens living and voting in a democracy must use higher-level reasoning skills, such as balanced and critical thinking, to make wise choices.

"In a nation whose citizens are to be led by persuasion and not by force, the art of reasoning becomes of the first importance."

—Thomas Jefferson

Research indicates that political campaigns in America are making more frequent use of manipulative media advertisements. These ads rely on short sound bites, one-sided arguments, and powerful visual images, which are intentionally designed to appeal to emotions and encourage simplistic thinking (Goleman, 1992). The need for Americana citizens to develop and deploy higher-level thinking skills may be more important today than at any other time in the nation’s history, because these are the mental skills that empower voters to detect and resist the growing use of political propaganda.

Higher-level thinking is an important safeguard against prejudice, discrimination, and hostility.

Racial, ethnic, and national prejudices often stem from narrow, self-centered, or group-centered thinking (Paul & Elder, 2002). Prejudice often results from oversimplified, dualistic thinking that can lead individuals to categorize other people into either in-groups (“us”) or out-groups (“them”). This type of dualistic thinking can lead, in turn, to ethnocentrism—the tendency to view one’s own racial or ethnic group as the superior “in-group,” while other groups are seen as inferior “out-groups.” Development of higher-level thinking skills, such as taking multiple perspectives and using balanced thinking, counteracts the type of dualistic, ethnocentric thinking that can lead to prejudice, discrimination, and hatred.

Higher-level thinking is an important safeguard against mental deterioration and dementia.

Research shows that people who spend more time engaged in higher-level thinking tend to experience better mental and physical health. Simply put: Those who use their mind don’t lose their mind—they’re less likely to lose their memory or experience dementia (e.g., Alzheimer’s disease) later in life (Wilson, Mendes, & Barnes, 2002). While there is a tendency to divide the “mind” (mental) and “body” (physical) into separate categories, thinking is not merely a mental activity; it’s also a physical activity that exercises the brain, much like physical activity exercises muscles in other parts of the body. Higher-level thinking requires physical energy and stimulates biological activity among brain cells, invigorating them and making them less susceptible to deterioration. Studies show that use of higher-level thinking skills increases both the number and strength of connections between brain cells (“Optimizing Those Brain Cells,” 2002).

"You know you’ve got to exercise your brain just like your muscles."

 —Will Rogers, humorist, vaudeville performer, and actor

Furthermore, thinking is a mentally stimulating activity that represents a totally natural and very inexpensive form of self-entertainment. It doesn’t cost anything to do it; you don’t need to purchase heavy machinery or high-tech equipment; you can do it anywhere at any time, when you’re alone or with others; you can do it while you’re standing in line, sitting in the bathroom, or lying in bed; and you can do it with your eyes open or closed.

Chapter 7

*Reading Objectives*

7.1 Recognize the meaning of the higher-level thinking skill, *application* (applied thinking).

7.2 Recognize the difference between the higher-level thinking skills of *analysis* and *synthesis*.

 (p. 168)

7.3 Recall an example of the following key perspectives of *multidimensional* thinking:

 a) *person*

 b) *place*

 c) *time*

 d) *culture*. (p. 169)

7.4 Recall *three* key *dimensions* of human *culture*. (p. 170)

7.5 Recall the meaning of the term, “*inferential* reasoning” and how it may be demonstrated by:

 (a) citing *empirical evidence*

 (b) using principles of *logical consistency*. (pp. 171-172)

7.6 Recognize the following types of logical reasoning *errors*:

 a) *dogmatism*

 b) *selective perception*

 c) *double standard*

 d) *straw man argument*

 e) *circular reasoning* (a.k.a., *begging the question*). (pp. 173-174)

7.7 Recognize the meaning of *balanced thinking*. (p. 175)

7.8 Recognize the meaning of *critical thinking*. (p. 176 )

7.9 Recall how *creative* thinking and *critical* thinking typically *complement* one another to

 improve the overall quality of our thinking. (p. 177)

7.10 Recognize the major steps in the process of *brainstorming*. (p. 178)

7.11 Recall *three* strategies for developing your *higher-level thinking* skills (pp. 179-181)

7.12 Recognize the meaning of the term, *meta-cognition*. (p. 179)

7.13 Recall *three* strategies for stimulating your *creative thinking* skills. (pp. 184-184)

7.14 Recall why higher-level thinking skills are becoming increasingly *important* in today’s

 “*information age*.” (p. 184-185)

7.15 Recall why higher-level thinking is an important safeguard *against prejudice and*

 *discrimination*. (p. 185)

Chapter 7

Short *Essay* Questions

(Linked to specific reading objectives)

1. A key aspect of multi-dimensional thinking is the ability to view an issue from *multiple*

 *perspectives*. Provide an example of how *each* of the following four key perspectives helps us

 gain a more complete understanding of any issue:

 (a) the perspective of *person*,

 (b) the perspective of *place*,

 (c) the perspective of *time*, and

 (d) the perspective of *culture*.

 [Reading objective: 7.3; Answer: p. 169]

2. One key perspective that needs to be taken in order to gain a comprehensive understanding of

 any issue is the perspective of *culture*, which includes a number of different dimensions or

 components. Briefly describe *three* key *dimensions* or *components* of human culture.

 [Reading objective: 7.4; Answer: p. 170]

3. In college, you’ll frequently use the higher-level thinking skill *of inferential reasoning*. Define

 this type of thinking and briefly describe how it can be demonstrated by:

 (a) citing *empirical evidence*, and

 (b) using principles of *logical consistency*.

 [Reading objective: 7.5; Answer: pp. 171-172]

4. Although critical and creative thinking are different forms of higher-level thinking, they often

 work hand-in-hand to improve the quality of our thinking and decision-making. Briefly

 explain how *creative* and *critical* thinking work together in a *complementary* way to improve

 the quality of our ideas.

 [Reading objective: 7.9 Answer: p. 177]

5. Rapid advances in modern information technology are increasing the demand for workers who

 think creatively or innovatively. Describe *three* specific strategies or approaches that can be

 used to stimulate your *creativity*. [Reading objective: 7.13; Answer: pp. 183-184]

6. We are currently living in an era that’s been called the “*information age*.” Briefly explain why

 higher-level thinking skills are especially important for *success* in this era.

 [Reading objective: 7.14; Answer: pp. 184-185]

7. Prejudice and discrimination continue to plague our country and our world. Briefly explain

 why or how higher-level thinking skills help provide a *safeguard* against the development of

 *prejudice* toward other groups of people.

 [Reading objective: 7.15; Answer: p. 185]

*True-False* & *Multiple-Choice* Questions

(Linked to specific reading objectives)

1. When you convert knowledge into *action* and actually put your knowledge for such

 *practical* purposes as solving problems or resolving issues, you’re engaging in the higher-

 level thinking skills known as \_\_\_\_\_\_ .

 (a) inferential reasoning

 (b) applied thinking (application)

 (c) balanced thinking

 (d) multidimensional thinking

 (e) wishful thinking.

 [Reading objective: 7.1; Answer: (b), p. 168]

2. If you were asked to critically *analyze* an issue, you should *break down* the issue and examine

 its key elements or parts.

 (a) True

 (b) False.

 [Reading objective: 7.2; Answer: (a), p. 168]

3. Which one of the following mental tasks represents the higher-level thinking skill of

 *synthesis*?

 (a) evaluating or judging the quality of an argument

 (b) breaking down an argument into its elements or parts

 (c) integrating separate pieces of information into a larger whole

 (d) drawing a conclusion by means of inferential reasoning.

 [Reading objective: 7.2; Answer: (c), p. 168]

4. Which one of the following forms of higher-level thinking involves making a well-reasoned

 *judgment or evaluation*?

 (a) synthesis

 (b) divergent thinking

 (c) creative thinking

 (d) critical thinking.

 [Reading objective: 7.8 Answer: (d), p. 176]

5. If you know someone who is *closed-minded*, that person is demonstrating:

 (a) dogmatism

 (b) wishful thinking

 (c) begging the question (circular reasoning)

 (d) inferential reasoning.

 [Reading objective: 7.6; Answer (a), p. 173]

6. Prejudiced people always seem to *notice* examples or instances that *support* their prejudice,

 but often *fail to see* instances that *contradict* it. This failure to acknowledge evidence that

 contradicts one’s point of view illustrates the reasoning error of:

 (a) double-standard

 (b) begging the question (circular reasoning)

 (c) dogmatism

 (d) selective perception

 (e) immaculate reception.

 [Reading objective: 7.6; Answer: (d), p. 173]

7. The expression, “Do as I *say*, not as I *do*” best reflects a reasoning error known as:

 (a) dogmatism

 (b) selective perception

 (c) straw man argument

 (d) double standard

 (e) double jeopardy.

 [Reading objective: 7.6; Answer: (d), p. 173]

8. In a political debate, candidate A accuses candidate B of being “pro drugs” when, in fact,

 candidate B simply voted “yes” on a bill to legalize marijuana only for medical use by people

 suffering from certain diseases. Candidate A is demonstrating a reasoning error known as:

 (a) dogmatism

 (b) double standard

 (c) begging the question (circular reasoning)

 (d) straw man argument

 (e) tin man trick.

 [Reading objective: 7.6; Answer: (d), p. 174]

9. A person argues that Blacks and Whites should not marry because “they’re not the same race.”

 This person’s argument demonstrates a reasoning error known as:

 (a) inferential reasoning

 (b) selective perception

 (c) begging the question (circular reasoning)

 (d) straw man argument

 (e) Jim Crow logic.

 [Reading objective: 7.6; Answer: (c), p. 174]

10. A *balanced* thinker does *not* engage in selective perception.

 (a) True

 (b) False.

 [Reading objective: 7.7; Answer: (a), p. 175]

11. The *first* step in the process of brainstorming calls for *critical* thinking and the *final* step

 involves *creative* thinking.

 (a) True

 (b) False.

 [Reading objective: 7.10; Answer: (b), p. 178]

12. If you’re engaged in the mental process of *meta-cognition*, you are:

 (a) thinking creatively

 (b) thinking multi-dimensionally

 (c) thinking inferentially

 (d) thinking about your own thinking.

 [Reading objective: 7.12; Answer: (d), p. 179]

---------------------------------------------------------------------------------------------------------------------

Reading Objectives for Additional Material Excised from the

*First Edition* of the Text

#1. Recall *why* higher-level thinking skills are important for:

 (a) success in today’s “information age”

 (b) effective citizenship in a democratic nation

 (c) preventing prejudice and discrimination.

#2. Recall what is meant by the term, “*systems thinking*.”

#3. Recognize how a *theory* differs from a *hypothesis*.

#4. Recall the difference between *dualistic* and *dialectical (dialogic)* thinking.

#5. Recognize the following *forms* of higher-level thinking:

 a) *deductive* reasoning

 b) *inductive* reasoning.

#6. Recognize the difference between *convergent* and *divergent* thinking.

#7. Recall the meaning of *cognitive dissonance* and *two strategies* you can use to induce your

 own state of cognitive dissonance.

#8. Recall the meaning of the phrase, “*playing devil’s advocate*” and how it can be used to avoid

 “*group think*.”

Test Questions for Additional Material Excised from the *First Edition* of the Text

*Short-Essay Questions*

1. Higher-level thinking skills are obviously important for intellectual development and

 academic success in college; however, they also have benefits beyond college. Explain *why*

 higher-level thinking skills are important for:

 (a) *career* success in today’s “information age”

 (b) effective *citizenship* in a democratic nation

 (c) preventing *prejudice and discrimination*.

 [Reading objective #1]

2. Scholars argue to function effectively in today’s complex and interdependent world requires

 “systems thinking.” Briefly explain what is meant by the term, *systems thinking*.

 [Reading objective #2]

3. One way you can achieve balanced thinking is to put yourself in a mental state of *cognitive*

 *dissonance*. Explain what is meant by the term “cognitive dissonance” and briefly describe

 *two strategies* for putting yourself into this mental state.

 [Reading objective #7]

4. Playing the role of “*devil’s advocate*” is one way to maintain balanced thinking. Briefly

 describe the role of devil’s advocate and how it can be used to avoid the pitfalls of “group

 think.”

 [Reading objective #8]

*Multiple-Choice & True-False Questions*

1. Which one of the following types of thinking is *not* an effective form of higher-level

 thinking?

 (a) dualistic thinking

 (b) balanced thinking

 (c) critical thinking

 (d) creative thinking.

 [Reading objective #4]

2. Creative thinking is more likely to require *convergent* thinking; in contrast, critical thinking

 is more likely to involve *divergent* thinking.

 (a) True

 (b) False.

 [Reading objective #6]

3. Compared to a hypothesis, a *theory* is better supported by *evidence*.

 (a) True

 (b) False.

 [Reading objective #3]

4. Both inductive and deductive reasoning are forms of *inferential* reasoning.

 (a) True

 (b) False.

 [Reading objective #5]

5. Consider the following line of reasoning:

 “All flowers are plants;

 A rose is a flower, therefore

 A rose is a plant.”

 Which one of the following forms of higher-level thinking was used to reach the

 conclusion in the above argument?

 (a) inductive reasoning

 (b) deductive reasoning

 (c) dualistic thinking

 (d) wishful thinking.

 [Reading objective #5]

6. Inductive reasoning involves inferring a *general conclusion* based on specific

 instances or observations.

 (a) True

 (b) False.

 [Reading objective #5]