

College Faculty Handbook: Steps for Better Thinking

**A Classroom Model for Teaching, Learning, and
Assessing Higher-Order Thinking Skills**

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Draft: January 2006

The first edition of this handbook will be made available at www.WolcottLynch.com. It may periodically be updated and possibly re-titled. Before referencing this manuscript, be sure to check the Web site for the most current version. **Please send comments and suggestions to swolcott@WolcottLynch.com.**

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Acknowledgements

In 1992, Cindy Lynch and Karen Kitchener introduced me to the reflective judgment model as part of a FIPSE project at University of Denver. Cindy and I then began a 10-year partnership, producing the Steps for Better Thinking model and related materials. I have continued to develop these materials following Cindy's unfortunate death, but I greatly miss her friendship and amazing mind.

The early development of this work began when Cindy consulted with Col. David Porter, Maj. Anthony Aretz, and their colleagues at the U.S. Air Force Academy regarding levels of performance for what they called "framing and resolving ill-defined problems." Those consultations generated the idea that the skills in the reflective judgment scoring manual could be used to create a developmentally-sequenced problem solving model, which was eventually named Steps for Better Thinking.

The following people provided significant contributions:

- Karen Kitchener of University of Denver (retired) and Pat King of University of Michigan, who authored the reflective judgment model, the primary theoretical basis of Steps for Better Thinking (Karen also chaired Cindy's PhD committee, and they worked together on a FIPSE project)
- Kurt Fischer of Harvard University, who worked with Cindy during her doctoral program and generated many of the ideas about skill development that are presented in this manuscript
- Greg Huber, Cindy's partner, sounding board, contributor, and all-around supporter
- Char Gray of Lafayette College, who collaborated on the rubrics, problem-solving worksheets, and other materials
- Dick Seymann of Lynchburg College, who suggested the terminology of "steps"
- Alec Testa of Western Governors' University, who encouraged us to develop an online student tutorial
- Dasaratha Rama of Florida International University, who provided a first draft for definitions of terms at the bottom of the Steps for Better Thinking Competency Rubric
- Leslie Eldenburg of Arizona University, who helped integrate these materials into a textbook (and many people at John Wiley & Sons who supported our innovative pedagogical approach)
- Stuart Kellogg and Jennifer Karlin of South Dakota School of Mines & Technology, who sponsor the Steps for Better Thinking Listserv and encouraged development of a Certified Steps for Better Thinking Rater program (I'm working on that!)
- Participants in the 2003 Steps for Better Thinking Conference who struggle using the original assessment rubric, prompting development of the simpler and more classroom-oriented Steps for Better Thinking Competency Rubric
- Jerry Stonewater of Miami University, who worked with me to adapt the Washington State University rubric
- Ed Nufer at Idaho State University, who insisted that I should write this handbook sooner rather than later
- Students at University of Denver, University of Washington, Hong Kong University of Science & Technology, Instituto de Empresa, and Helsinki School of Economics--Mikkeli, who worked hard in my courses and participated thoughtfully in my many, ongoing classroom experiments

I apologize if I have failed to acknowledge other important contributors. Cindy worked with a large network of people, and I am probably not aware of the sources for all major ideas and suggestions.

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Chapter 1

Critical Thinking Learning Outcomes

This chapter:

- Discusses alternative definitions for “critical thinking”;
- Explores critical thinking using an open-ended problem solving framework called Steps for Better Thinking; and
- Uses an educational model to more deliberately link desired learning outcomes with the educational environment and student characteristics

What Is Critical Thinking?

Most colleges and degree programs include critical thinking as a learning goal. Educators view critical thinking as essential for their students’ personal, professional, and civic success. Although there is general agreement that critical thinking is important, no universally accepted definition of critical thinking exists. The problem of defining critical thinking was articulated well in the following description of a seminar called “Approaches to Critical/Creative Thinking” sponsored by the Faculty Resource Network at New York University:¹

Critical Thinking is something everybody knows something about and nobody knows everything about. It’s a skill many possess (or assume they do), yet few, whether they are good critical thinkers or not, have much of an idea what it is or how they do it. Some define it the way Louis Armstrong defined jazz (“Man, if you have to ask what it is, you’ll never know.”) Others define it the way a U.S. senatorial committee once described obscenity (“We know it when we see it.”) To some extent, at least, we are all critical thinkers, and we certainly recognize critical thinking when we see it in action. Nonetheless, it is useful to consider just what we mean by thinking critically and to consider how to help students develop what we loosely refer to as higher order thinking skills.

To more adequately help students develop critical thinking, educators need to clarify what they mean when they say they want students to think critically. As always, it is informative to consider the definitions provided by other educators. In a comprehensive monograph on critical thinking in higher education, Kurfiss (1988, 2) defined critical thinking as follows:

Critical thinking is...an investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified.

In one of his well-known books about critical thinking, Paul (1992, 7) discussed the meaning of critical thinking and the need for educators to develop and apply intellectual standards for critical thinking:

First, since critical thinking can be defined in a number of different ways consistent with each other, we should not put a lot of weight on any one definition. Definitions are at

¹ Source: <http://www.nyu.edu/frn/seminars/2006/2/index.nyu>.

best scaffolding for the mind. With this qualification in mind, here is a bit of scaffolding: critical thinking is thinking about your thinking while you're thinking in order to make your thinking better. Two things are crucial: 1) critical thinking is not just thinking, but thinking which entails self-improvement and 2) this improvement comes from skill in using standards by which one appropriately assesses thinking. To put it briefly, it is self-improvement (in thinking) through standards (that assess thinking).

To think well is to impose discipline and restraint on our thinking—by means of intellectual standards—in order to raise our thinking to a level of “perfection” or quality that is not natural or likely in undisciplined, spontaneous thought. The dimension of critical thinking least understood is that of intellectual standards. Most teachers were not taught how to assess thinking through standards; indeed, often the thinking of teachers themselves is very “undisciplined” and reflects a lack of internalized intellectual standards.

In recent years, educators throughout higher education have worked toward providing more explicit definitions of critical thinking. Examples of various definitions found on the Internet during December 2005 are shown in Exhibit 1.1.

Exhibit 1.1

Examples of Critical Thinking Definitions in Higher Education

Faculty Senate

Critical Thinking is a term used to refer to those kinds of mental activity that are clear, precise, and purposeful. It is typically associated with solving complex real world problems, generating multiple (or creative) solutions to a problem, drawing inferences, synthesizing and integrating information, distinguishing between fact and opinion, or estimating potential outcomes, but it can also refer to the process of evaluating the quality of one's own thinking. However, the precise collection of which critical thinking elements should be stressed in a particular class may vary depending on the nature of the subject matter at hand. In nearly all cases acquiring critical thinking competence requires that students be provided with opportunities to identify and challenge the assumptions of meaningful problems in a discipline as well as to explore alternative hypotheses or ways of thinking and acting.

Source: Glossary, Curriculum Resources, University Faculty Senate, The Pennsylvania State University, available at www.senate.psu.edu/curriculum_resources/guide/glossary.html

Student Handbook, Nursing & Health Sciences

Critical Thinking: A cognitive process based on reflective thought and a tolerance for ambiguity which has the following attributes:

- Disciplined and self directed.
- Oriented toward inquiry, analysis and critique.
- Multidimensional and multilogical problem-solving rather than unidimensional, monological, or linear requisite knowledge and ability to generate options and make discriminating judgments.

A model within nursing used to depict an aspect of critical thinking is the nursing process. The nursing process may be defined as a systematic problem solving method, used in any patient care situation, for

Exhibit 1.1 (continued)

assessing the patient’s health status and related needs, formulating nursing diagnosis, planning with the patient to resolve identified needs, implementing nursing interventions, and evaluating the outcomes to determine the effectiveness of the plan or the need for further revision.

Source: Definition of Curriculum Terms, Student Handbook, Beth-El College of Nursing & Health Sciences, University of Colorado at Colorado Springs, available at web.uccs.edu/bethelstudenthandbook/definition_of_curriculum_terms.htm

College Library Glossary

Critical Thinking: Reasonable reflective thinking that is focused on deciding what to believe or do. More precisely, it is assessing the authenticity, accuracy, and/or worth of knowledge claims and arguments. It requires careful, precise, persistent and objective analysis of any knowledge claim or belief to judge its validity and/or worth.

Source: Glossary, Seattle Central Community College Library, available at www.seattlecentral.org/faculty/jshoop/glossary.html

Discipline Glossary: American Studies

Critical Thinking - A complex set of cognitive skills employed in problem-solving and intellectual consideration and innovation. Critical thinking requires mental agility and thoughtful consideration: one must, almost simultaneously, be able to process and then analyze what is being presented, to make connections between various bits of information, to draw inferences from what has been stated directly, to question any assumptions and connections made, and to remain generally skeptical until sufficient proof is offered. Practice in critical thinking is designed to make your mind more powerful. This power is something you can apply to any profession and one of the major benefits of taking a humanities class.

Source: Glossary of Useful Terms, American Studies Learning Skills, Trinity College, available at www.trincoll.edu/~tvogel/gloss.htm

Faculty Handbook

Definition of Critical Thinking The term “critical thinking” when used by educators has varied meanings in different contexts—whether in formal logic courses where it has a precise meaning when applied to arguments or in casual discussions in a faculty lounge about students’ struggles to grasp the course content, where the term is used more loosely to simply mean good thinking.

In this handbook, “critical thinking” means sound thinking needed by practitioners in an academic discipline: accurate, relevant, reasonable, rigorous—whether it be analyzing, synthesizing, generalizing, applying concepts, interpreting, evaluating supporting arguments and hypotheses, solving problems, or making decisions. An academic discipline is a system of thinking about information and its applications. Course content should consist of helping students to learn how to find answers, solve problems, and make decisions the way practitioners in that discipline do. Learning factual content, applying factual content, and thinking about factual content are interdependent.

Source: Handbook of Critical Thinking Resources, Prince George’s Community College, available at academic.pg.cc.md.us/~wpeirce/MCCCTR/handbook.pdf

Exhibit 1.1 (continued)

Master Syllabus, Critical Thinking Course, Philosophy Department

Critical Thinking develops students' reasoning skills: their ability to recognize the differences between facts and opinions, to distinguish relevant from irrelevant information, to identify unstated assumptions, to detect bias, to recognize fallacious reasoning, and to evaluate claims, definitions and arguments. It helps students cultivate clear, disciplined and independent thinking that is readily applicable to their academic, social and personal pursuits. Critical Thinking also helps students apply their newly developed reasoning skills in their writing, which enables them to convey their ideas more clearly and effectively.

Source: Master syllabus, critical thinking course, Department of Philosophy, Wright State University, available www.wright.edu/~tom.sav/ucapc/wsuge03/gemaster/phl200.pdf

Chapter 3 in this handbook returns to the clarification of critical thinking skills for a course. In the meantime, here are a couple of general observations.

The first general observation is that student development of critical thinking is likely to be hindered by:

- A lack of explicit guidance about what critical thinking means;
- Differences in critical thinking definitions (when provided); and
- Variations in the factors used to assess and grade student critical thinking efforts.

The second general observation is that a variety of other terms might be used to describe learning outcomes or skills similar to critical thinking. Such terms include:

- | | |
|--------------------------|----------------------------|
| • Clinical judgment | • Professional judgment |
| • Continuous improvement | • Reasoning |
| • Debate | • Reflection |
| • Decision making | • Reflective judgment |
| • Higher-order thinking | • Research |
| • Inquiry | • Science |
| • Learning to learn | • Strategic planning |
| • Lifelong learning | • Total quality management |
| • Problem solving | • Wisdom |

Link Between Critical Thinking and Open-Ended Problem Solving

Here are examples of critical thinking tasks that students might be asked to address in a college setting:

- Critique a theory
- Compare and contrast multiple models or concepts
- Discuss the pros and cons of a governmental policy
- Develop a personal values statement
- Recommend improvements to an information system
- Interpret a piece of literature
- Create a patient care plan
- Modify a communication for a particular audience
- Qualitatively interpret numerical data

Notice that each of these tasks is open-ended, i.e., no one single “correct” solution exists. Students are expected to evaluate an ambiguous situation, gain new insights, and/or arrive at a reasonable—rather than only—conclusion while facing significant and enduring uncertainties. *Open-ended problems* (also called *unstructured, ill-defined, or ill-structured problems*):

- Cannot be described completely
- Have more than one solution option
- Generate controversy, even among experts
- Contain incomplete information that is subject to a variety of interpretations
- Have solution options with unknown outcomes
- Cannot be resolved with certainty
- Often need to be addressed repeatedly over time as conditions change and better information becomes available

A Process for Addressing Open-Ended Problems: Steps for Better Thinking

The problem-solving process presented in Exhibit 1.2 is called Steps for Better Thinking. It illustrates one way to think about how people with strong critical thinking skills deal with open-ended problems. (The illustration in Exhibit 1.2 is also provided in Appendix A, p. A-2.) You might want to photocopy this figure for quick reference as you proceed through this handbook.

Examine Exhibit 1.2 carefully from the bottom to the top. Each sequential step of the process—identify, explore, prioritize, and envision—is a building block that helps individuals move toward better solutions to open-ended problems. The steps help people organize their work and deal with problems as thoroughly as time and other resources permit. More thorough efforts in the lower-level steps support stronger performance in the higher-level, more complex steps. The entire structure builds upon the foundation knowledge and skills—often referred to as content knowledge—that students need to adequately address problems within a particular domain.

More thorough efforts in the lower-level steps support stronger performance in the higher-level, more complex steps.

Let’s explore how this problem-solving process works. Consider how an individual with strong critical thinking skills would address the following classroom assignment. As you examine Exhibit 1.2 and think about how a student might respond to this assignment, visualize how the world would look if you were climbing a huge step-like structure in a forest of information.

What to Do About Fraud?

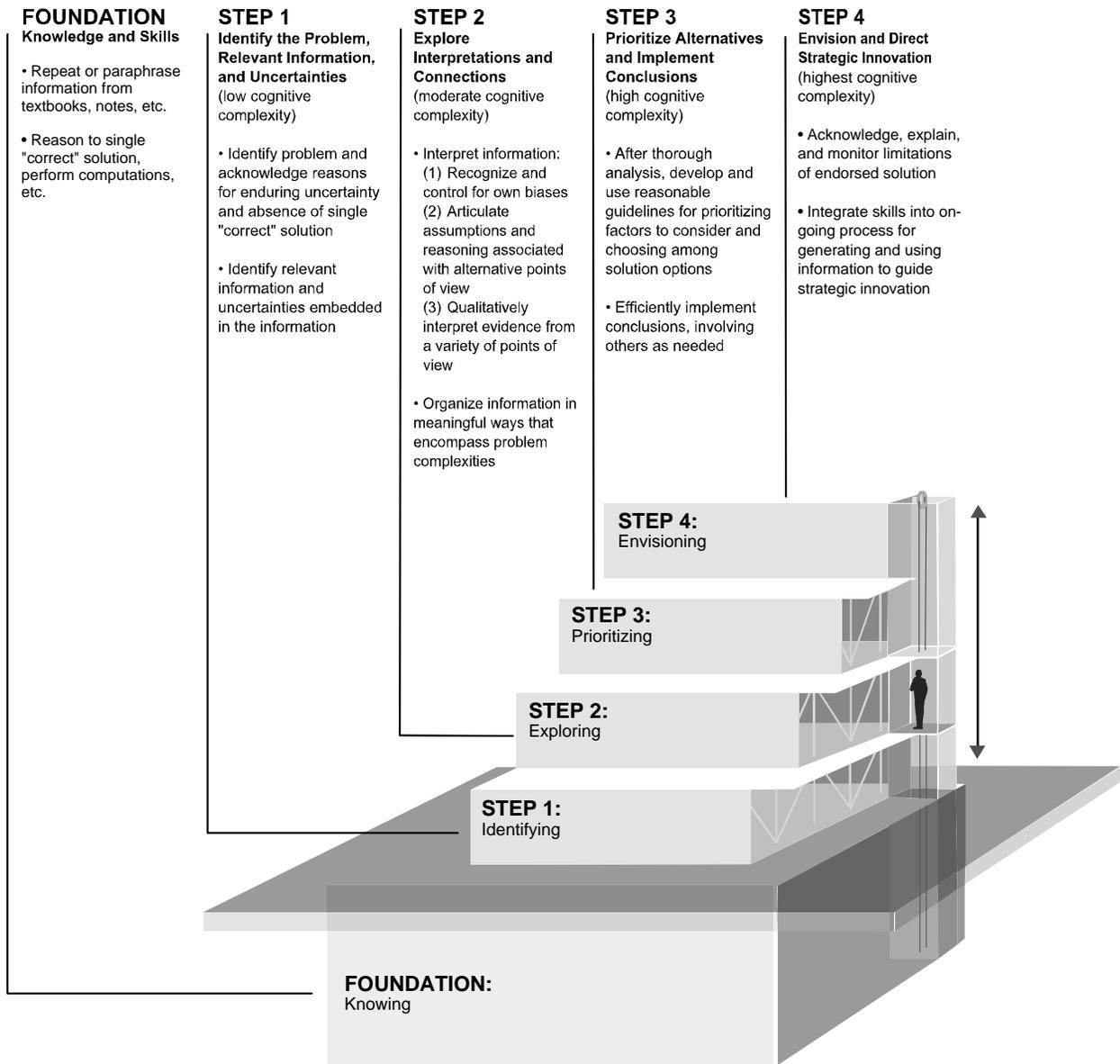
[This assignment was given to students in a sophomore-level introductory financial accounting course. Students were asked to read approximately 8 pages of excerpts from the report of the “Special Investigative Committee” of WorldCom, Inc., filed with the Securities and Exchange Commission on June 9, 2003. The report described a major financial accounting fraud committed by the managers of

Exhibit 1.2



STEPS FOR BETTER THINKING

A Developmental Problem Solving Process



© 2002, Susan K. Wolcott. Please cite this source: Wolcott, S. K. (May 31, 2002). Steps for Better Thinking: A Developmental Problem Solving Process [On-line]. Available: <http://www.WolcottLynch.com>. Model evolved from ideas presented in King and Kitchener's (1994) reflective judgment model of cognitive development and Fischer's (Fischer & Bidell, 1998) dynamic skill theory.

(This figure can be downloaded under "Educator Resources" at www.WolcottLynch.com.)

WorldCom during 1999 through 2002, the motivations behind the fraud, and the methods that were used to commit it. The report also discussed the fact that at least some employees, beyond those directly involved, were aware of the fraudulent activities.]

Assignment:

Many people at WorldCom were either aware of or actively participated in the company's fraud. Suppose you were an employee at WorldCom who was not directly involved, but you became aware of the fraud. Analyze alternative actions you could have taken, and propose a course of action. As you analyze this situation, be sure to address uncertainties about how you should respond, the possible effects of your actions on others as well as yourself, and how you weighed issues in reaching a conclusion. Your response should be 1-2 pages in length, single spaced.

Step 1: Identify the Problem, Relevant Information, and Uncertainties

Components (see Exhibit 1.2):

- Identify problem and acknowledge reasons for enduring uncertainty and absence of single "correct" solution
- Identify relevant information and uncertainties embedded in the information

In the fraud assignment, Step 1 skills include identifying a range of possible courses of action, recognizing uncertainties about which course of action is best, and seeking relevant information to help make a decision. An individual with strong critical thinking skills would recognize that many possible courses of action exist for this problem. Even the most obvious options such as "blowing the whistle" could be implemented in a variety of ways, leading to additional possible courses of action. For example, the fraud might be reported to different recipients, alternative forms of communication might be used, and the timing of the disclosure must be chosen. Major uncertainties include an inability to know with certainty what will occur under different options. For example, would the individual be fired or experience other negative repercussions if he/she decides to "blow the whistle" and report the fraud? Would the choice of recipient affect the consequences of the fraud information? What would be the effects on various groups of people such as shareholders and company employees if the fraud becomes known now versus at some later time? Relevant information might include readings about the experiences of other people who have faced similar situations, studies about how financial reporting fraud has affected shareholders in other situations, and personal values that might affect the decision.

When faced with an open-ended problem, individuals draw on their foundation of knowledge and basic skills, which continue to expand throughout their lives. Prior to engaging in the problem-solving process, they may be aware of a particular problem in a vague way. From the bottom of the structure at Step 1, their view is very limited. While they can identify individual pieces of information and uncertainties related to the problem at hand, they may initially find it difficult to "see the forest for the trees." As they inventory relevant information and articulate their initial, personal perspective on a problem in Step 1, they draw from the information in their foundation and organize the information in a way that makes sense to them. When they recognize important gaps in their information, they may search out the needed information, expand their foundation of knowledge, and add the new information to their field of consideration. This provides a springboard for moving up to Step 2.

Step 2: Explore Interpretations and Connections

Components (see Exhibit 1.2):

- Interpret information:
 - Recognize and control for own biases
 - Articulate assumptions and reasoning associated with alternative points of view
 - Qualitatively interpret evidence from a variety of points of view
- Organize information in meaningful ways that encompass problem complexities

In the fraud assignment, Step 2 skills include interpreting information in light of the uncertainties identified in Step 1. An individual with strong critical thinking skills would consider a wide range of perspectives, explore the pros and cons of different actions under various sets of assumptions, and consider how his/her biases might adversely affect the analysis. Because this problem involves an ethical dilemma, the individual might explore options in light of one or more ethical frameworks. Of particular importance in this assignment is the ability to pull together a messy range of issues and perspectives into a manageable framework for generating a reasonable conclusion.

As individuals ascend the structure in Exhibit 1.2, their perspective grows to encompass the individual objects or pieces of information below in a larger view. Step 2 allows them to step up and see beyond their personal perspective. They can look beyond explicit information and articulate how different set of assumptions and experiences can lead to different conclusions about an open-ended problem. They apply a variety of analysis techniques to the same information set and interpret the results from different perspectives. Quality of evidence, and not just quantity, is important in Step 2. They use Step 2 skills to explore the larger picture of the situation because they understand that strong reasoning is more than just stacking up reasons and evidence to support their initial opinion. Although there are practical limitations on the amount of time and other resources that one can spend on Step 2 analyses, more thorough analyses set the stage for well-founded decisions in Step 3.

Step 3: Prioritize Alternatives and Implement Conclusions

Components (see Exhibit 1.2):

- After thorough analysis, develop and use reasonable guidelines for prioritizing factors to consider and choosing among solution options
- Efficiently implement conclusions, involving others as needed

In the fraud assignment, Step 3 skills include prioritizing the pros and cons of various options and applying personal values to make a decision. An individual with strong critical thinking skills would think beyond his/her initial impressions, clarify the types of values to apply in this situation, and explicitly choose the trade-offs to be made across competing interests. The decision maker must also make plans for potential interactions with others as the decision is implemented. For example, individuals who choose to “blow the whistle” must consider how their communication will be perceived by others and develop strategies for increasing the likelihood of desired responses.

After thoroughly analyzing essential data from a variety of perspectives (Step 2), successful critical thinkers must move up the step-like structure in Exhibit 1.2 to gain an even more comprehensive view of the situation. In Step 3, they generate reasonable guidelines that overarch the different solution options and perspectives on the problem and use those guidelines to judge as objectively as possible among solution options. Step 3 skills must be built on the careful analysis that is impossible in the absence of Step 2 skills. Making decisions without that complex analysis is sometimes called “jumping to conclusions,” which severely limits the probability of achieving the best decision.

The second part of Step 3 skills is achieving results through the involvement of others. This involvement occurs throughout the problem solving process via communications and other interactions. Individuals operating with less complex skills may have good communication skills in terms of mechanics and articulating arguments; however, they may be unable to prioritize issues in a way that encourages others to take efficient action or that avoids conflict. The importance of Step 3 skills lies in being able to make very good choices about the best way to achieve results through effective interactions with others who have different perspectives. Step 2 skills greatly enhance an individual's ability to understand the perspectives and potential actions of others, and Step 3 skills allow implementation of well-founded decisions involving others.

Step 4: Envision and Direct Strategic Innovation

Components (see Exhibit 1.2):

- Acknowledge, explain, and monitor limitations of endorsed solution
- Integrate skills into ongoing process for generating and using information to guide strategic innovation

In the fraud assignment, Step 4 skills include recognizing that no “perfect” course of action exists and adequately anticipating future issues that might arise as a result of the incident and the selected response. An individual with strong critical thinking skills would plan for change and reinterpretation of the fraud situation as the planned course of action is implemented and would be prepared to modify the plan as circumstances change. Strong critical thinking skills also involve reflecting on this situation over time, potentially leading to a reassessment of values and even more appropriate responses to future situations.

From the top of the structure (Step 4 in Exhibit 1.2), individuals can see far and wide. They still have information about the trees below, but now they can also consider the larger landscape such as approaching weather or changes that might be introduced by people who are journeying toward the step-like structure. This allows more adequate monitoring of the situation and deliberate planning that is more likely to be successful. Step 4 is a much more complex form of the "identifying" skills described in Step 1. What expert decision makers typically call "identifying the problem" probably means the very complex Step 4 skills rather than the much simpler skills associated with Step 1.

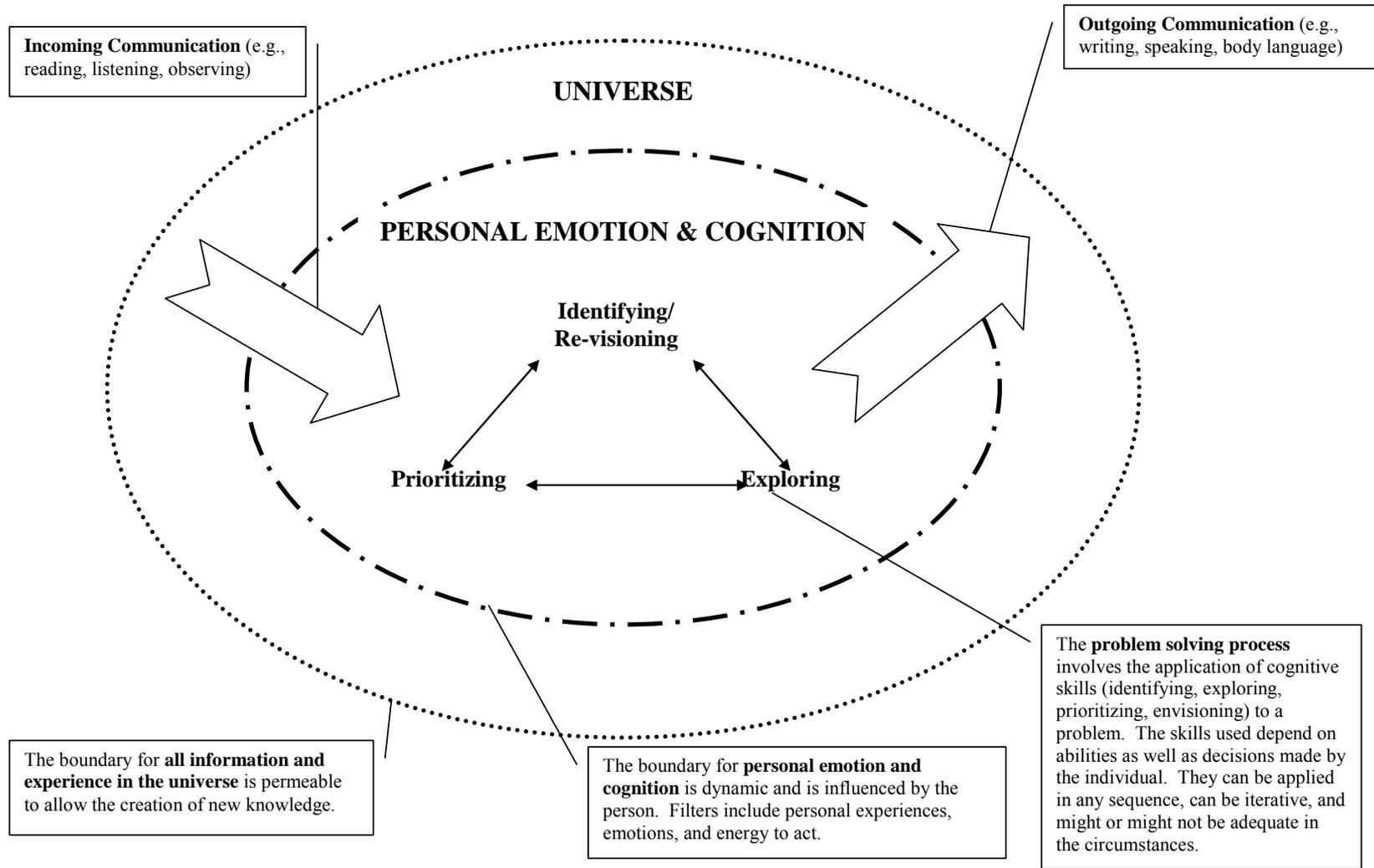
Strong critical thinkers must take the “long view” in thinking about problems. They synthesize information in new ways. They devise innovative inquiry strategies to generate information over time, helping them to be more confident in their decisions. They refine their approaches to a problem as new information becomes available and deliberately apply what they learn to new situations. Although creativity and intuition can come into play at any point in the problem solving process, it is much more likely to be productive with Step 4 skills because the new ideas can be tested through ongoing inquiry. Cutting edge research requires Step 4 skills, and this is what moves a discipline or profession forward.

Nonlinear Problem Solving

In most instances, “real-life” problem solving is not as tidy as Exhibit 1.2 suggests. For example, it is not necessarily desirable or even feasible to approach problems in a strictly linear fashion (Step 1, Step 2, etc.). Exhibit 1.3 provides a more realistic, nonlinear depiction of the problem-solving process.

Individuals with strong critical thinking skills could move through the process in any order. They may return to Step 1 repeatedly as they learn more about the problem and discover the need for additional information. Creativity and intuition can cause them to move temporarily to different steps. Although Step 4 "envisioning" suggests that the problem solving process might go on endlessly, it can be halted temporarily or permanently at any time. The “construction elevator” in Exhibit 1.2 is intended to represent similar concepts; an individual can move back and forth among the steps and can stop at any time.

Exhibit 1.3 Nonlinear Problem-Solving Process



Although critical thinking skills are often used nonlinearly, as shown in Exhibit 1.3, the skills tend to develop in the linear sequence shown in Exhibit 1.2 (see Chapter 2). Therefore, Exhibit 1.2 provides a more useful framework for critical thinking teaching and learning.

Weaker Problem Solving

So far, we have discussed how individuals with strong critical thinking skills address open-ended problems. Most students do not use strong critical thinking skills. For example, students often “jump to a conclusion.” When this occurs, they have not spent adequate effort on crucial “identifying” and “exploring” activities (Steps 1 and 2), which weakens the likelihood that their conclusion or solution is the best possible. Other students have even weaker skills. They fail to recognize that a problem is open-ended, so do not recognize that multiple valid perspectives exist. Chapter 2 describes common patterns in the way students address open-ended problems.

Even students with strong problem solving skills may fail to demonstrate all of them. For example, the problem might not be sufficiently important to justify additional effort; sometimes students are “too tired to think straight;” sometimes they do not take the time necessary to carefully address the problem; and sometimes the setting is too fraught with emotional issues that hinder progress.

Differences Between Experts and Novices

In addition to having access to a more substantial foundation of information, experts in a given field use information in ways that most students cannot. Experts continuously integrate Step 1, 2, and 3 skills, envision change, and then monitor and refine strategies for dealing with open-ended problems. Experts with Step 4 skills can identify problems, relevant information, and uncertainties in much more complex ways than novices. Because they have seen similar patterns of information and have developed strategies for identifying situations that do not fit expectations, experts explore the problem and establish priorities much more efficiently than novices. This explains why it may be difficult for professors to describe and demonstrate their thought processes thoroughly for students.

To experts, thinking about open-ended problems becomes somewhat automatic. Without some reflection, they may no longer be aware of all the steps they have mastered in learning to address open-ended problems effectively. Consider Exhibit 1.4, which describes the steps needed to adequately interpret a company’s financial statement ratios. Ratio analysis is a common task given to students in introductory financial accounting courses. Because they are expert at such analyses, accounting educators often fail to recognize the complexity of the process that novice students must undergo. This is particularly true for Step 1 aspects of the problem—to experts, the identification of uncertainties and relevant information tends to be “obvious.”

An Educational Model for Development of Critical Thinking

Developmental psychologists have known for many years that the way a person addresses open-ended tasks is affected by the individual’s level of cognitive complexity. *Cognitive complexity* is the degree to which mental processes are composed of multiple, integrated parts and encompass information that is increasingly abstract or removed from physical objects (discussed in more detail in Chapter 2).

Furthermore, the developmental psychology literature demonstrates that most students think at a level of complexity that is too low for adequate performance on many open-ended problems (King & Kitchener, 1994; also see “Data About Patterns of Performance” in Chapter 4 of this handbook). This is one of the main reasons professors are often frustrated with student critical thinking performance.

Educators need to learn about cognitive complexity for two important reasons. First, cognitive complexity determines how students go about performing educational tasks. Second, information about students’

Exhibit 1.4

Steps for Better Thinking Skills Needed to Adequately Analyze Financial Statement Ratios

	←Less Complex		More Complex →	
Content Knowledge	Step 1—Identifying	Step 2—Exploring	Step 3—Prioritizing	Step 4—Envisioning
<ul style="list-style-type: none"> * Find formulas and calculate ratios * Locate financial information used in calculation * Locate comparative information for comparable companies/industry * Recognize and adjust calculations for differences in ratio formulas in different sources * Determine whether higher/lower ratios are generally associated with greater: profitability, liquidity, stability, activity, etc * Describe the mechanical impact of accounting entries on ratio results. 	<ul style="list-style-type: none"> * Explain why ratios aren't "absolute" measures of profitability, liquidity, stability, activity, etc. * Explain why higher/lower ratios don't always indicate a better/worse company * Explain why financial experts might disagree about the interpretation of a company's ratios * Explain why ratios aren't the same for all companies. Identify factors that cause ratio values to differ across companies and across years for the same company. * Identify information that might be useful in interpreting a company's ratios, including competitor/ industry ratios, accounting methods employed, and non-financial information 	<ul style="list-style-type: none"> * Identify and compensate for own biases in ratio interpretation * Describe possible business reasons why ratios vary across companies and across years * Identify and evaluate the quality of assumptions underlying alternative interpretations of a company's ratios * Explain how different stakeholders might view ratios differently * Explore the strengths and weaknesses indicated by the time trend and competitor comparison of a company's ratios * Describe the strengths and weaknesses of using ratios to evaluate a company * Incorporate non-ratio information in the interpretation of ratios * Adjust for and evaluate the impact of alternative accounting methods on ratio interpretations * Organize and summarize the information from your analysis 	<ul style="list-style-type: none"> * Prioritize the strengths and weaknesses of the company's ratios and other data in reaching a conclusion about the company's profitability, liquidity, stability, activity, etc. * Effectively communicate your interpretation for a given setting and audience * Effectively encourage others to take a specific action (e.g., grant a loan) based upon your interpretation 	<ul style="list-style-type: none"> * Describe limitations to a conclusion about a company's profitability, liquidity, stability, activity, etc. resulting from a ratio analysis * Identify circumstances that might cause a change in conclusions about a company's ratios * Develop a plan for monitoring a company's performance in the future * Investigate and work toward implementation of new, superior methods of ratio analysis

Analysis of financial statement ratios is an open-ended problem often given to students in introductory financial accounting courses. Susan Wolcott developed the breakdown shown above to learn more about the challenges her students face when she asks them to perform a ratio analysis.

current levels of cognitive complexity can be used to design educational methods that are more likely to promote higher levels of critical thinking performance. Fortunately, the developmental psychology literature provides us with a great deal of guidance on these matters.

Consider the model of student learning in Exhibit 1.5 (adapted from Rama et al., 2000). *Desired learning outcomes* are the knowledge, skills, and competencies educators would like students to achieve in a course or program. *Student characteristics* are the students' abilities, attitudes, physical characteristics, demographics, and so forth that affect learning. The *educational environment* is the setting educators provide for students, including teaching methods, peer interactions, physical facilities, and so on. Panel A depicts a scenario in which greater student achievement occurs through a higher degree of alignment among desired learning outcomes, student characteristics, and the educational environment than in Panel B. In other words, the desired learning outcomes and the educational environment must be appropriate for students' developmental needs and other characteristics if educators wish students to achieve greater critical thinking skills.

Although other student characteristics may have important implications for student development, the focus in this handbook is limited to the characteristic of cognitive development and how that characteristic fits with desired learning outcomes and the educational environment. As discussed more fully over the next few chapters, students' cognitive skills emerge sequentially, from less complex to more complex, as described in Steps for Better Thinking (Exhibit 1.2). Students are unlikely to develop desired critical thinking skills if educational efforts are aimed at skills that are either too simplistic or too complex—i.e., if educational activities fail to sufficiently align with students' cognitive characteristics.

Students are unlikely to develop desired critical thinking skills if educational efforts are aimed at skills that are either too simplistic or too complex.

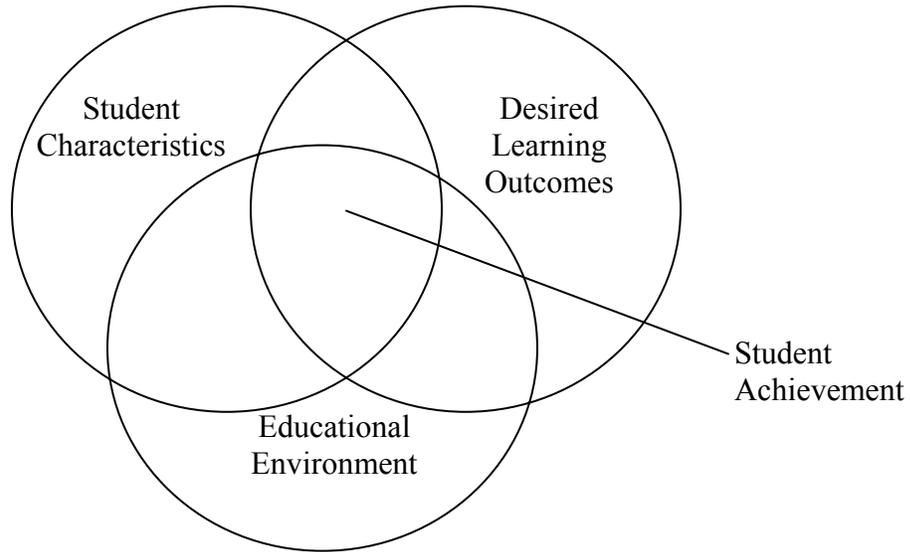
Exhibit 1.6, adapted from Exhibit 1.5, summarizes the various ways this handbook considers student cognitive development to promote greater student achievement. In Chapter 2 we describe different approaches to critical thinking that are grounded in scientific observations of cognitive development. Chapter 3 demonstrates the use of Steps for Better Thinking to identify reasonable desired learning outcomes, given students' levels of cognitive complexity. Chapter 3 offers suggestions for designing and using assignments to promote student development. Chapter 4 describes the assessment process and provides examples using different assessment rubrics.

Exhibit 1.5

Factors Influencing Student Achievement of Learning Outcomes

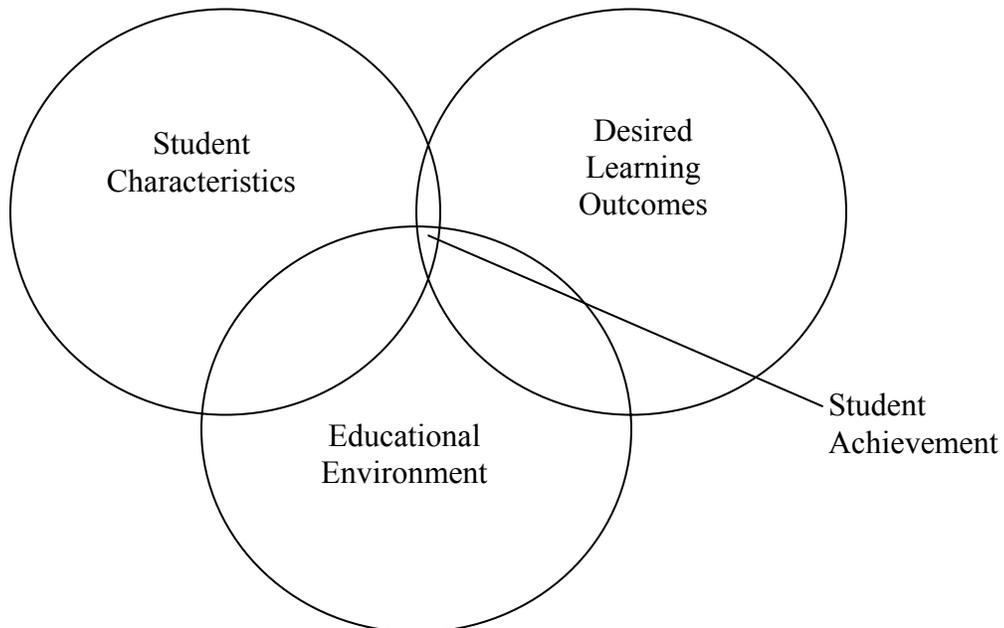
Panel A

More student achievement when a *higher* degree of alignment exists among desired learning outcomes, student characteristics, and the educational environment.



Panel B

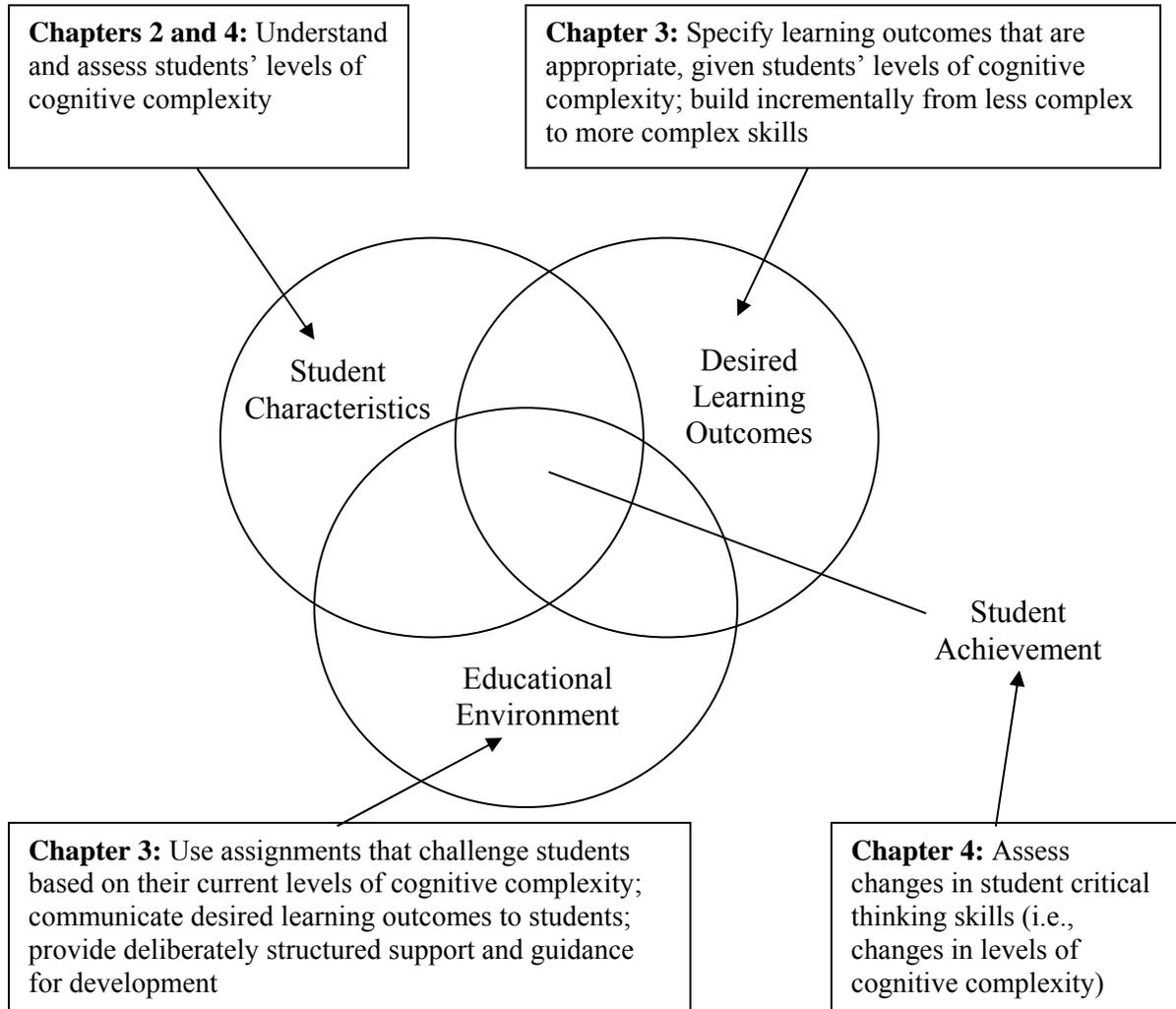
Less student achievement occurs when a *lower* degree of alignment exists among desired learning outcomes, student characteristics, and the educational environment.



Adapted from Rama, et al., 2000.

Exhibit 1.6

Using Information About Students' Cognitive Complexity to Develop and Assess Critical Thinking Skills



Chapter 1 References

King, P. M., and Kitchener, K. S. (1994). *Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults*. San Francisco: Jossey-Bass.

Kurfiss, J. G. (1988). *Critical thinking: Theory, research, practice and possibilities* (ASHE-ERIC Higher Education Report No. 2). Washington, DC: Association for the Study of Higher Education.

Paul, R. W. (1992). *Critical Thinking: What Every Person Needs to Survive in a Rapidly changing World* (Revised 2nd Ed). Santa Rosa, CA: Foundation for Critical Thinking.

Rama, D. V., Ravenscroft, S. P., Wolcott, S. K., & Zlotkowski, E. (2000). Service-learning outcomes: Guidelines for educators and researchers. *Issues in Accounting Education*, 15(4), 657-692.

Suggested Professor Activities

The following activities are designed to help you reflect upon and implement the ideas presented in this chapter. You may wish to engage in these activities individually or with colleagues.

1. Use mission statements, course syllabi, or other documents to identify the desired learning outcomes (i.e., skills, competencies, or educational objectives) for your course or program. Which of these outcomes do you think are related to “critical thinking”? Which do you think are related to the skills for addressing open-ended problems?
2. Ask colleagues individually to write down their own definitions of “critical thinking.” As a group, compare your definitions and discuss ways in which your definitions are similar and dissimilar. Then discuss the impact these similarities/dissimilarities might have on student learning in your program.
3. Think about and/or discuss with your colleagues the proposition in this chapter that critical thinking is not separate and distinct from open-ended problem solving.
4. Consider the components of Exhibit 1.2 for a desired learning outcome for your course or program by asking questions such as the following:
 - How did you decide that the desired learning outcome is appropriate for your course or program?
 - How might student characteristics affect their performance?
 - How might you consider student characteristics in designing the educational environment?
 - What are the pros and cons of your educational environment for students’ development of this learning outcome?
 - What degree of performance do your students achieve?
 - How do you document student performance?
 - What might you do to improve the degree of achievement for your students?
5. Identify an open-ended problem you ask students to address. Using Exhibits 1.2 and 1.4 as guides, break the problem down into the skills students must use for adequate performance.

Chapter 2

Critical Thinking Performance Patterns

This chapter:

- Describes typical patterns of student critical thinking performance using Steps for Better Thinking as a framework; and
- Explains why critical thinking skills must be constructed over time, moving from less complex toward more complex skills.

The Need to Help Students Develop Critical Thinking Skills

Students may be able to recite entire textbooks, correctly answer multiple choice questions, and perform complicated mathematical computations. But unless they have developed the thinking skills to adequately address open-ended problems, they will not be very successful. Those who have constructed stronger skills for *using* and *creating* information are better prepared to deal with personal, professional, and civic problems.

Classroom Vignette

Every semester, Professor Chow saw the same student reactions to her introductory sociology course. Most of the students reacted negatively to the introduction of ambiguity. They clearly expected sociology to involve only memorization of “facts.” In contrast, there were always at least a few students who grasped the idea that sociology involves uncertainty about the interpretation of social rules and processes. They easily learned to discuss alternative interpretations of empirical observations. Professor Chow wondered why more of her students couldn’t be like those.

The skills in Steps for Better Thinking do not automatically develop as students grow older and are exposed to information or course “content” (King & Kitchener, 1994; also see “Data About Patterns of Performance” in Chapter 4 of this handbook). Professors need to do much more than merely share information with students. Professors and students must collaborate in *building* students’ critical thinking skills. Focusing on the steps between typical student performance and strong performance can help professors optimize students’ growth during the relatively short period of a college education. This chapter provides a mental model for that developmental focus.

Below are descriptions of a series of performance patterns, or developmental phases, that individuals go through as their critical thinking skills emerge and mature. Based on 25 years’ research involving hundreds of individuals, King and Kitchener (2004, p. 5) concluded that these performance patterns are related to peoples’ assumptions about knowledge:

...we have made three major observations: (a) there are striking differences in people’s underlying assumptions about knowledge, or epistemic assumptions; (b) these differences in assumptions are related to the way people make and justify their own judgments about [open-ended] problems; and (c) there is a developmental sequence in the patterns of responses and judgments about such problems.

Steps for Better Thinking, introduced in Chapter 1 (see Appendix A, p. A-2), provides the framework for the discussion of performance patterns. Steps for Better Thinking is grounded in King & Kitchener's (1994, 2004) reflective judgment model and Fischer's dynamic skill theory (Fischer, 1980; Fischer & Bidell, 1998; Fischer & Pruyne, 2002)¹

Research from developmental psychology indicates that most college seniors exhibit Step 1 skills, but their Step 2, 3, and 4 skills are weak. Each step must be constructed through practice that involves time and deliberate effort in working with open-ended problems. The students' environment must provide necessary materials and encouragement (information and support) for constructing the skills, but students must do the work. As students construct the steps, they reorganize less complex skills and integrate them into more complex skills. More complex skills allow them to understand the world more fully and to use information in more meaningful ways.

The tasks or skills listed in Steps for Better Thinking build on each other in a self-scaffolding manner. This means that without strong performance in the lower steps, strong performance in the higher steps is unlikely. Step 1 skills emerge first, with Step 2, 3, and 4 skills remaining very weak. In an environment that encourages the development of critical thinking, students later became able to perform both Step 1 and 2 skills, with Step 3 and 4 skills remaining weak. Given adequate time and support, students may become able to consistently demonstrate Step 1, 2, and 3 skills, setting the stage for the emergence of Step 4 skills.

Without strong performance in the lower steps, strong performance in the higher steps is unlikely.

Visualize the construction elevator on the right side of the Steps for Better Thinking illustration as a student's awareness of a problem solving process. A student's willingness to engage in a particular step in the process is like moving the elevator up to the desired step and opening the elevator door. Unfortunately, most students have not developed adequate skills to be able to move effectively up and down among the steps. Professors bear responsibility for understanding students' developmental needs and providing an environment where students can succeed as they construct their critical thinking skills.

Steps for Better Thinking Performance Patterns

The skills in Steps for Better Thinking emerge in a developmental, self-scaffolding sequence. Individuals having the strongest critical thinking skills typically have progressed through five different patterns of skills called *performance patterns*. A performance pattern is a set of skills used by an individual when he or she addresses an open-ended problem. The following sections describe five prototypical students representing five performance patterns:

- ***Confused Fact-Finder***, whose Step 1, 2, 3, and 4 skills are weak;
- ***Biased Jumper*** who has adequate Step 1 skills, but whose Step 2, 3, and 4 skills are weak;
- ***Perpetual Analyzer*** who has adequate Step 1 and 2 skills, but whose Step 3 and 4 skills are weak;

¹ In their 1994 book about the reflective judgment model of cognitive development, King and Kitchener presented a meta-analysis of almost two decades of research. The sequence of skills shown in Steps for Better Thinking is embedded in the scoring manual for Reflective Judgment Interview research (Kitchener & King, 1985/1996). Dynamic skill theory later describes the psychological underpinnings of the developmental sequence.

- **Pragmatic Performer** who has adequate Step 1, 2, and 3, skills, but whose Step 4 skills are weak; and
- **Strategic Re-Visioner** who integrates Step 1, 2, and 3 skills into a strategic approach that is characteristic of Step 4 skills.

This handbook gives substantial attention to the first two patterns—Confused Fact-Finder and Biased Jumper—because:

- These patterns describe the majority of undergraduate populations, and
- The way of thinking in these patterns is most dissimilar to how professors and other experts deal with open-ended problems.

The descriptions below include key indicators for each performance pattern, plus examples of typical beliefs which can hinder development of skills in the next step of the problem-solving process. The skills associated with each performance pattern are internally consistent with the underlying beliefs. Thus, awareness of these beliefs can help professors better understand students' struggles and misinterpretations of educational tasks. Chapter 3 presents further information about how these prototypic students respond in classes and offers guidance for working with students who exhibit different performance patterns.

The Confused Fact-Finder: Performance Pattern 0

The Confused Fact-Finder represents students whose Step 1, 2, 3, and 4 skills are weak. As illustrated in Exhibit 2.1, you can visualize the Confused Fact-Finder stepping out of an open elevator door into a space where none of the steps (skills) has been sufficiently constructed. The problem solver risks a dangerous fall—failure to adequately address the problem at hand.

Key Indicators for the Confused Fact-Finder (Performance Pattern 0)

(adapted from Kitchener & King, 1985/1996, Stages 2 and 3)

Overall approach to open-ended problems:

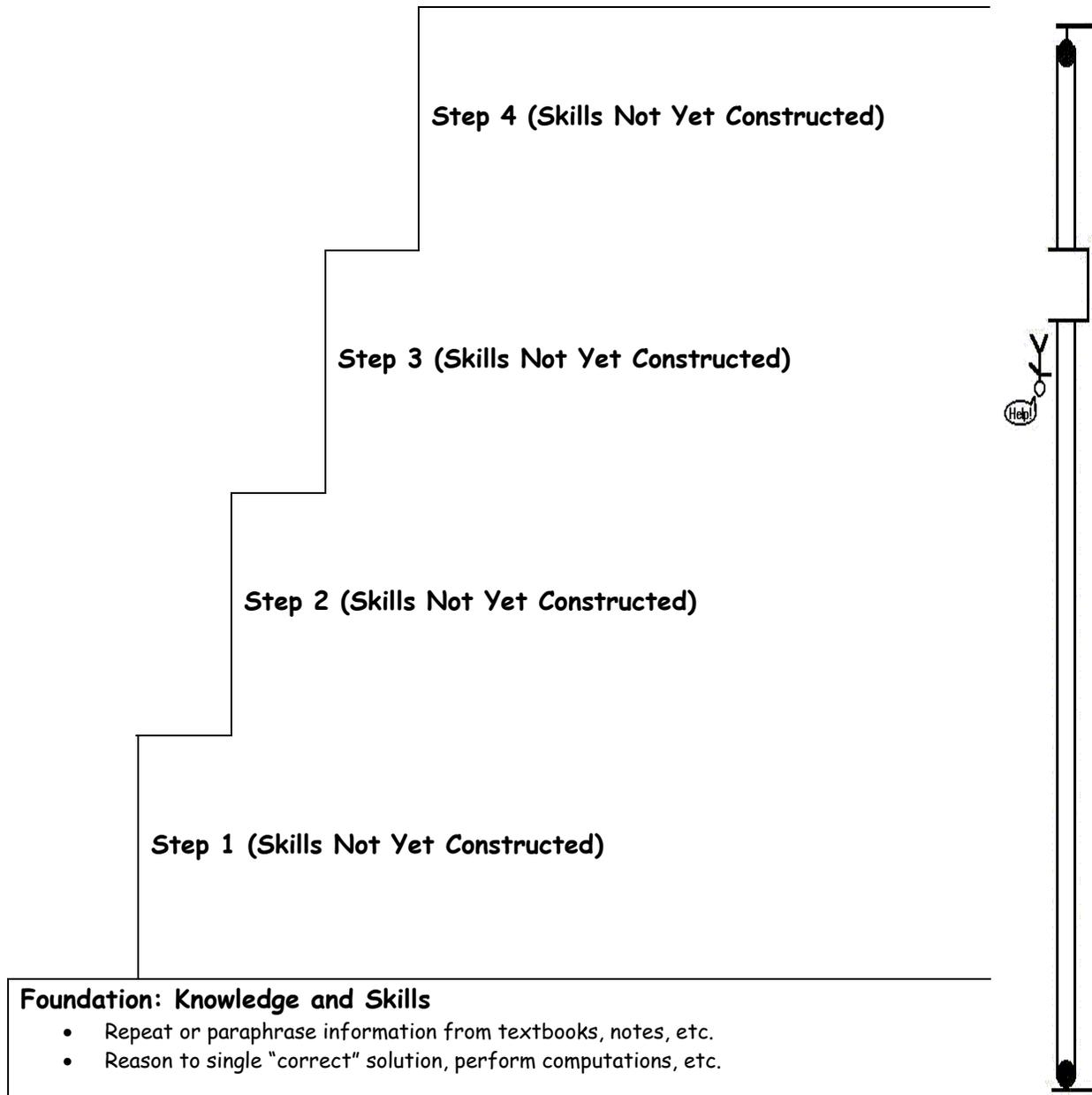
- Proceeds as if goal is to find the single, “correct” answer

Common weaknesses:

- Fails to realistically perceive uncertainties/ambiguities and complexities
- Does not seem to “get it”; recasts an open-ended problem to one having a single “correct” answer
- Insists that professors, textbooks, or other experts should provide “correct” answer
- Expresses confusion or futility
- Provides illogical or contradictory arguments
- Cannot evaluate or appropriately apply evidence
- Inappropriately cites textbook, “facts,” or definitions
- Appears unable to read carefully
- Concludes based on unexamined authorities' views or what “feels right”

The Confused Fact-Finder has a strong tendency to deny ambiguity. This is particularly true in cases where his prior perception is that the subject matter is highly structured with clearly distinguishable right

Exhibit 2.1 The Confused Fact-Finder: Performance Pattern O



and wrong answers. In fact, the Confused Fact-Finder may be attracted to a major if he believes it is a highly structured discipline.

This student assumes that knowledge is either absolutely certain now, or it is temporarily uncertain until experts find the “correct” answer. Accordingly, he cannot distinguish between highly structured problems that have a “correct” answer and open-ended problems. For example, he may believe that uncertainties about historical events will cease to exist as soon as all of the “facts” become known. He fails to understand that it may not be possible to perfectly observe past events or to understand why even historians often disagree about the meaning of historical events. The Confused Fact-Finder believes it is the job of experts (including professors) to come up with the correct answers to all problems.

The Confused Fact-Finder fails to realistically perceive the complexities and ambiguities of open-ended problems, and he does not understand the legitimacy of different points of view. Sometimes he adopts the unexamined view of a “good” authority and believes that those who hold alternative views are wrong or bad. In cases where he perceives temporary uncertainty, he believes that differences in points of view are unimportant, because the answer is not yet known for sure by anyone. In such cases, the Confused Fact-Finder may become disillusioned with authorities because he views their opinions as capricious. He is unable to recognize qualitative differences or to evaluate evidence.

The Confused Fact-Finder does not acknowledge the need to make a well-founded judgment; all problems have answers that are dichotomous (e.g., right/wrong, good/bad, or smart/stupid). He sees his role in educational settings as finding the correct answer—repeating and paraphrasing textbook information, class notes, and other authoritative sources of information. In cases where he fails to recognize even temporary uncertainty, he is likely to rely on the unexamined opinion of an expert or other authority. If he is highly motivated, he might spend many hours looking for authoritative information that provides the right answer. In other cases where he believes that authorities do not yet know all the right answers, he tends to reach and justify his opinion based on prior beliefs or his “feelings.” He sometimes asserts that his opinion is “logical,” but he does not consistently use logical arguments to reach or to justify a conclusion.

Classroom Vignettes: The Confused Fact-Finder

Professor Bergen was reflecting on her last finance class session. Part of the session involved identifying and discussing possible reasons why some companies pay dividends while other companies do not. Several of the students seemed to be completely off the mark—they kept referring to “good” or “bad” managers instead of identifying possible reasons, such as differences in free cash flows, which might cause differences in companies’ dividend policies.

Professor Ramakrishnan was grading his modern history examination. One question required students to describe the pros and cons of U.S. involvement in the Gulf War. Instead of describing pros and cons, several students simply described the war.

Beliefs of the Confused Fact-Finder That Hinder Progress

One of the reasons it is not easy for the Confused Fact-Finder to exhibit more complex thinking skills is that he probably holds a number of beliefs that hinder his progress. Following are the most important of these beliefs (adapted from Stages 2 and 3 in Kitchener & King, 1985/1996; and King & Kitchener, 1994):

- Knowledgeable persons or experts know or will find correct answers to all problems
- Uncertainty either does not exist or is merely temporary
- Until experts can agree, opinions are equally correct or equally biased guesses
- It is sufficient to view problems without attention to realistic ambiguities and complexities

The Biased Jumper: Performance Pattern 1

The Biased Jumper represents students whose Step 2, 3, and 4 skills are weak. As illustrated in Exhibit 2.2, you can visualize the Biased Jumper stepping out of an open elevator door into a space where only the set of skills in only one of the steps has been sufficiently constructed. Although she has important skills that the Confused Fact-Finder lacks, the Biased Jumper still risks a dangerous fall—failure to adequately address the problem at hand.

Key Indicators for the Biased Jumper (Performance Pattern 1)

(adapted from Kitchener & King, 1985/1996, Stage 4)

Overall approach to open-ended problems:

- Proceeds as if goal is to stack up evidence and information to support conclusion

Major improvements over Performance Pattern 0:

- Acknowledges existence of enduring uncertainties
- Recognizes the viability of multiple perspectives
- Begins to use evidence logically to support conclusions

Common weaknesses:

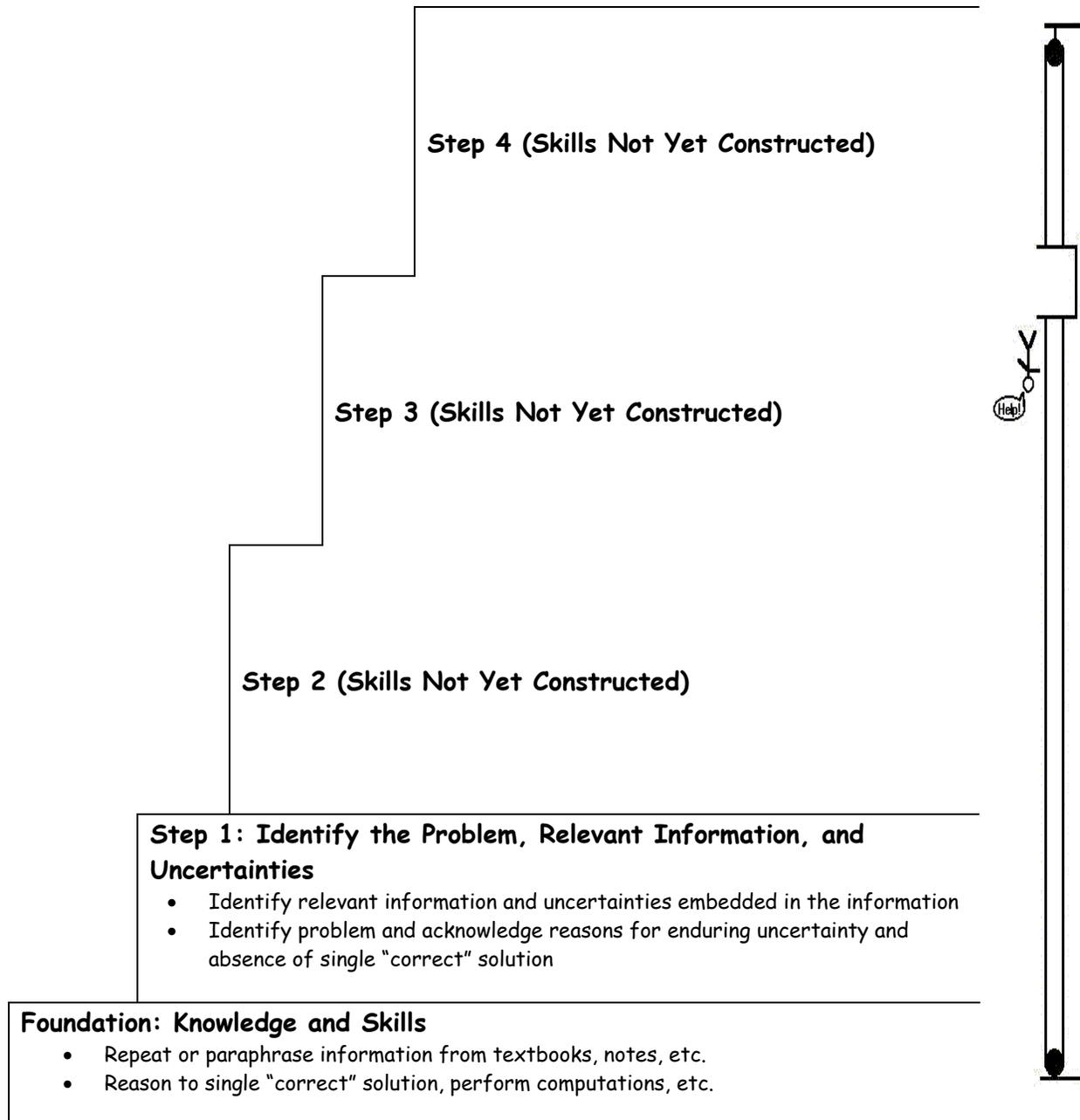
- Jumps to conclusions
- Stacks up evidence quantitatively to support own view and ignores contrary information
- Equates unsupported personal opinion with other forms of evidence
- Inept at breaking problem down and understanding multiple perspectives
- Insists that all opinions are equally valid, but discounts other opinions
- Views experts as being opinionated or as trying to subject others to their personal beliefs

The Biased Jumper is the prototypical student who exhibits adequate Step 1 skills (identifying the problem, relevant information, and uncertainties), but does not consistently exhibit adequate Step 2, 3, and 4 skills. Unlike the Confused Fact-Finder, the Biased Jumper can distinguish between well-structured and open-ended problems. Nevertheless, her understanding of open-ended problems is rather limited. Without substantial support, she tends to simplistically attribute uncertainties to a superficially narrow set of limitations such as lack of information and inability to predict the future. With adequate support, she can learn to articulate uncertainties associated with:²

- Describing the problem accurately and completely,
- The range of potential solution options,
- The completeness of the available information and the availability of new information in the future,
- The best way to use and interpret the available information,
- The potential outcomes of various solutions, and
- Whether and how conditions related to the problem might change.

² These uncertainties were listed in Chapter 1, but they are repeated them here because this aspect of critical thinking is so often overlooked by professors. Unlike many students, professors tend to automatically understand these limitations and their implications in dealing with open-ended problems.

Exhibit 2.2 The Biased Jumper: Performance Pattern 1



Unlike the Confused Fact-Finder, the Biased Jumper begins to acknowledge the role of evidence and can use evidence and arguments to support her own position. She makes her own judgments and no longer relies on experts to provide the answers to open-ended problems. Because she understands that open-ended problems have no single “correct” solution, she recognizes that different people can have different opinions. Thus, she acknowledges the existence of multiple perspectives.

Unfortunately, the Biased Jumper has not yet developed an adequate framework within which to understand information about open-ended problems. Accordingly, she tends to look at problems superficially, rather than complexly and broadly. This approach leads to several observable weaknesses in her approach to open-ended problems. First, she is likely to equate unsupported personal opinion with other forms of evidence. Second, she does not yet recognize that evidence must be interpreted based on qualitative differences. Third, she has a limited view of the reasons for differences in points of view, believing that differences arise solely because of personal characteristics (e.g., upbringing, intentional bias, or individualism). These beliefs often cause her to ignore or discount alternative viewpoints. Fourth, due to her own skill limitations, she fails to fully understand that experts (including professors) reach conclusions through a complex process of identifying and interpreting evidence from a variety of legitimate perspectives. Thus, she often views experts as being opinionated or as trying to subject others to their personal beliefs. These characteristics of the Biased Jumper make it difficult for her to break problems down, understand problems from multiple perspectives, control for her own biases, and weigh evidence and arguments.

Because of her skill limitations, the Biased Jumper tends to “jump to conclusions.” She rather simply stacks up reasons and evidence to support her own position without giving careful consideration to viable alternatives. She often ignores or discounts information that contradicts her own point of view. She sometimes seems overly confident in her conclusions because of her limited understanding of alternative viewpoints. She may insist that all opinions that can be supported with evidence are equally valid. Because of this and also because her own solution is not well supported, she may become defensive if challenged or when confronted with new evidence. If she is less settled in her conclusions, she may capriciously change her position.

Classroom Vignettes: The Biased Jumper

Professor Ramakrishnan was grading his modern history examination. One question required students to describe the pros and cons of U.S. involvement in the Gulf War. Instead of describing pros and cons, several students provided only the pros OR the cons, but not both.

Two of Professor McDonald’s students were very angry about the grades on their Psychology paper. One confronted the professor and argued, “I don’t understand how I could get a C—I did the work!” The other angry student complained on the teaching evaluation, “The professor was very biased in her grading.”

Beliefs of the Biased Jumper That Hinder Progress

It is not easy for the Biased Jumper to exhibit more complex thinking skills because she may hold a number of beliefs that hinder her progress. Following are the most important of these beliefs (adapted from Stage 4 in Kitchener & King, 1985/1996, and King & Kitchener, 1994):

- Uncertainty is due only to specific limitations such as lost or incorrect reporting of data, limited resources, or inability to correctly predict the future

- Differences in points of view arise solely because of personal characteristics (e.g., upbringing, intentional bias, or individualism)
- Conflicting points of view for which evidence can be provided are equally valid
- Criticizing an argument is the same as criticizing the person who makes the argument
- It is sufficient to simply stack up evidence that supports one's opinion
- Experts are biased persons who are simply promoting their own agenda

The Perpetual Analyzer: Performance Pattern 2

The Perpetual Analyzer represents students whose Step 3 and 4 skills are weak. As illustrated in Exhibit 2.3, you can visualize the Perpetual Analyzer stepping out of an open elevator door into a space where sets of skills in only two of the steps have been sufficiently constructed. Although he has important skills that the Confused Fact-Finder and Biased Jumper lack, the Perpetual Analyzer still risks a dangerous fall—failure to adequately address the problem at hand.

Key Indicators for the Perpetual Analyzer (Performance Pattern 2)

(adapted from Kitchener & King, 1985/1996, Stage 5)

Overall approach to open-ended problems:

- Proceeds as if goal is to establish a detached, balanced view of evidence and information from different points of view

Major improvements over Performance Pattern 1:

- Presents coherent and balanced description of a problem and the larger context in which it is found
- Identifies issues, assumptions, and biases associated with multiple perspectives
- Attempts to control own biases
- Logically and qualitatively evaluates evidence from different view points
- Organizes information meaningfully

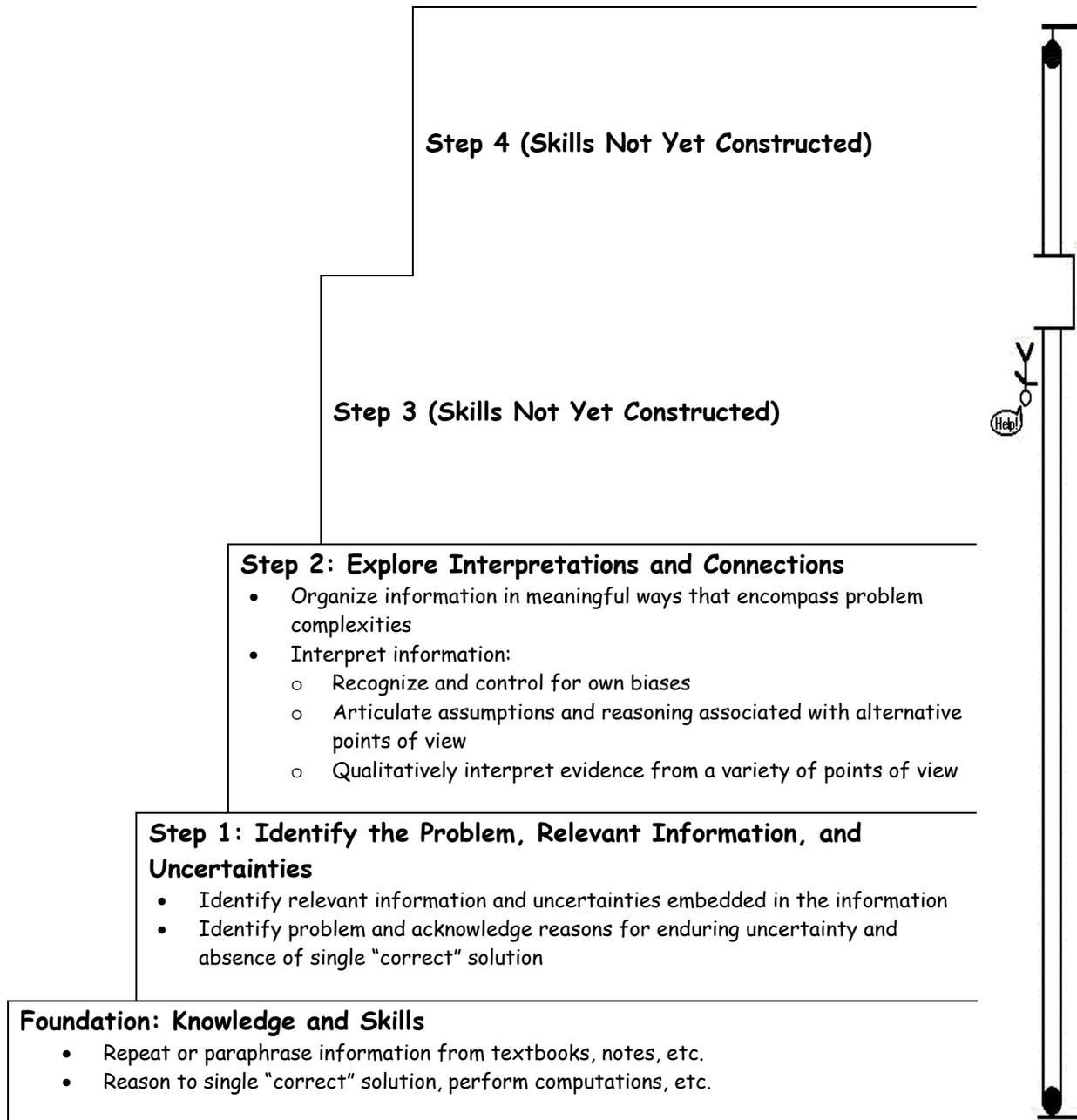
Common weaknesses:

- Unable to establish priorities for judging across alternatives
- Reluctant to select and defend a single overall solution as most viable, or selects a solution but unable to express adequate support for its superiority over other solutions
- Writes overly long paper in attempt to demonstrate all aspects of analysis (problems with prioritizing)
- Jeopardizes class discussions by getting stuck on issues such as definitions

The Perpetual Analyzer exhibits adequate Step 1 and Step 2 skills (explore interpretations and connections), but he does not consistently exhibit adequate Step 3 and 4 skills. He is capable of understanding problems in a very complex way and can talk about how different facets of a problem lead to its complexity. He is aware of his own limitations and biases in understanding a problem, and he understands others' viewpoints, too. He begins to understand how experts come to their conclusions via evidence and perspective. He believes that different viewpoints result from interpretations of information within individual perspectives, and he can qualitatively interpret evidence from different perspectives. For example, he can analyze the assumptions that underpin the views of different people regarding the safety of genetically modified foods and discuss the strengths and weaknesses of related research evidence.

Although the Perpetual Analyzer's reasoning skills allow him to draw logical conclusions within a given perspective, his greatest difficulty is in prioritizing factors that apply across solution options or

Exhibit 2.3 The Perpetual Analyzer: Performance Pattern 2



perspectives. This often causes him to be reluctant to select and defend a single overall solution as most viable. He may select a solution but be unable to articulate adequate support for its superiority over other solutions. Thus, he has a tendency to get stuck in the process of analyzing and exploring the problem.

Classroom Vignette: The Perpetual Analyzer

Professor Vaughn was very excited as she read this student's paper. "At last," she thought, "I'm reading a paper by a student who knows how to analyze." By the end of the paper, however, she had become disappointed. The student's conclusion was very weak. After presenting the relevant information and analyses, the paper seemed to "fizzle."

Beliefs of the Perpetual Analyzer That Hinder Progress

The Perpetual Analyzer may find it difficult to exhibit Step 3 and 4 skills because he holds a number of beliefs that hinder his progress. Following are the most important of these beliefs (adapted from Stage 5 in Kitchener & King, 1985/1996, and King & Kitchener, 1994):

- Endorsing one alternative denies the legitimacy of other alternatives
- Problem solutions may be justified only within a given context or from a given perspective, making it very difficult to endorse and justify a solution as the best alternative
- There are no overarching criteria by which to choose among competing evidence-based interpretations or solutions

The Pragmatic Performer: Performance Pattern 3

The Pragmatic Performer represents students whose Step 4 skills are weak. As illustrated in Exhibit 2.4, you can visualize the Pragmatic Performer as being able to use a construction elevator to move among Steps 1, 2, and 3 as she addresses a problem. However, the top step is not yet built, preventing the problem solver from fully addressing the problem at hand.

Key Indicators for the Pragmatic Performer (Performance Pattern 3)

(adapted from Kitchener & King, 1985/1996, Stage 6)

Overall approach to open-ended problems:

- Proceeds as if goal is to come to a well-founded conclusion based on objective comparisons of viable alternatives

Major improvements over Performance Pattern 2:

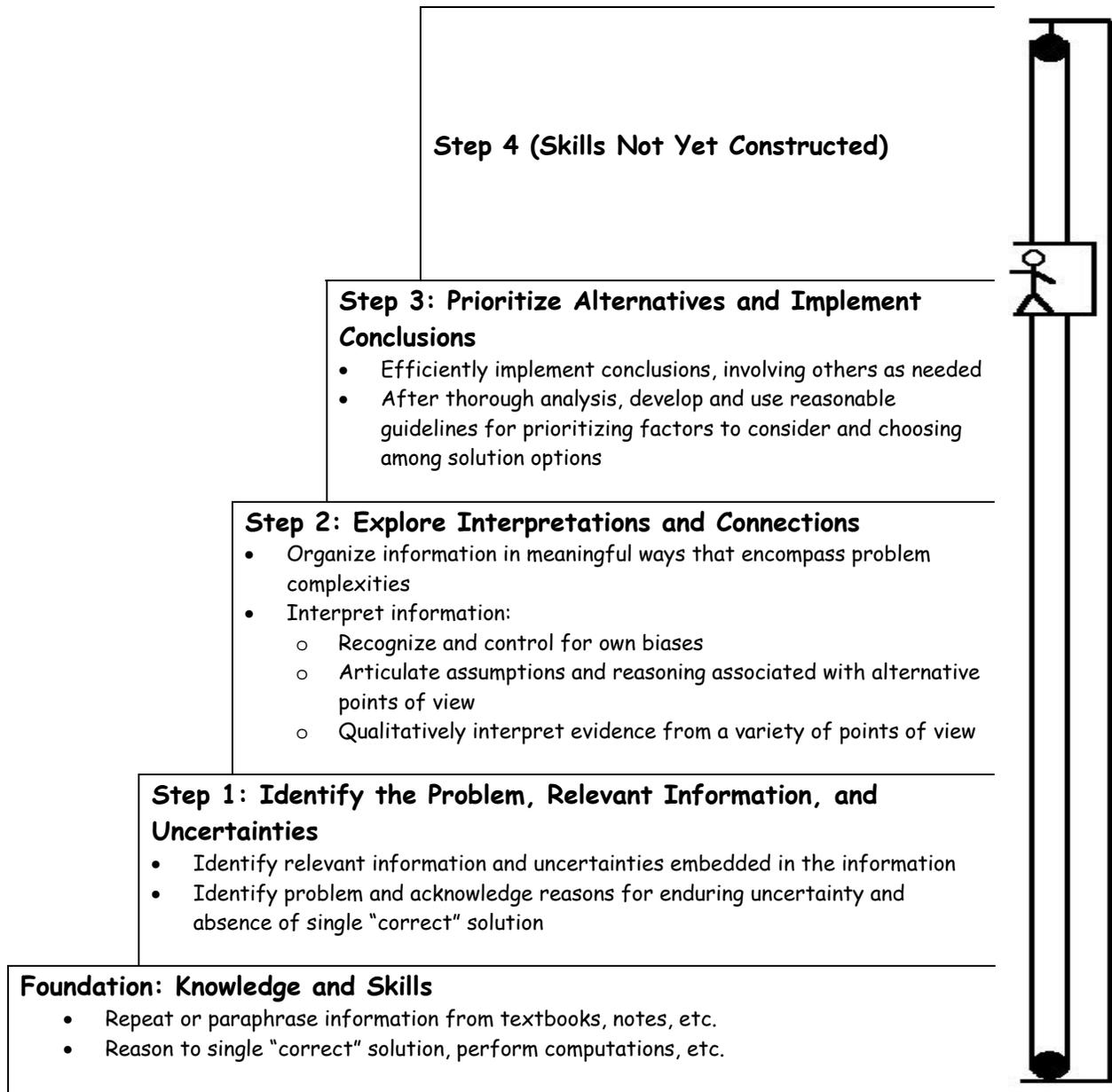
- After thorough exploration, consciously prioritizes issues and information
- Articulates well-founded support for choosing one solution while objectively considering other viable options
- Conclusion based on qualitative evaluation of experts' positions or situational pragmatics

Common weaknesses:

- Does not address value-added possibilities
- Does not seek or embrace change
- Conclusion does not give sufficient attention to long-term, strategic issues
- Inadequately identifies and addresses solution limitations and "next steps" in a cycle of continuous improvement

Exhibit 2.4

The Pragmatic Performer: Performance Pattern 3



The Pragmatic Performer exhibits the skills associated with Steps 1, 2, and 3 (prioritize alternatives and implement conclusions), but she does not consistently exhibit adequate Step 4 skills. She explores a problem from different perspectives as thoroughly as time and other resources permit (Step 2). She then articulates and weighs a variety of factors as she looks across available options and endorses one as most viable. For example, she recognizes tradeoffs across perspectives when deciding how to vote on a political issue or when interpreting a work of literature. In implementing her conclusions, she carefully prioritizes information for particular audiences, addressing their different concerns in a reasonable manner. Her primary weakness is in coordinating her skills into an efficient, ongoing problem solving process that constructs new knowledge and optimizes decisions over time.

Classroom Vignette: The Pragmatic Performer

Professors Wu and Kessler were sharing some of their recent experiences in teaching the business strategies course. “I’m sure that some of these students can think more strategically than they demonstrate in the case papers they write for my class,” Professor Wu complained. “But they just don’t seem to take the time to think past making the most obvious recommendation. Maybe they are too busy interviewing for jobs this semester.”

Beliefs of the Pragmatic Performer That Hinder Progress

The Pragmatic Performer may fail to exhibit Step 4 skills in part because she holds a number of beliefs that hinder her progress. Following are the most important of these beliefs (adapted from Stage 6 in Kitchener & King, 1985/1996, and King & Kitchener, 1994):

- Points of view about specific situations may be judged as better than others only in a very tentative way based on one’s evaluations of experts’ positions or the pragmatics of the situation at hand
- There are no generalized principles and procedures that can be used to further investigate one’s resolution to the problem

The Strategic Re-Visioner: Performance Pattern 4

The Strategic Re-Visioner represents the rare student who can adequately perform Step 1, 2, 3, and 4 skills. As illustrated in Exhibit 2.5, you can visualize the Strategic Re-Visioner as being able to use a construction elevator to move among all of the steps as he addresses a problem.

Key Indicators for the Strategic Re-Visioner (Performance Pattern 4)

(adapted from Kitchener & King, 1985/1996, Stage 7)

Overall approach to open-ended problems:

- Proceeds as if goal is to construct knowledge, to move toward better conclusions or greater confidence in conclusions as the problem is addressed over time

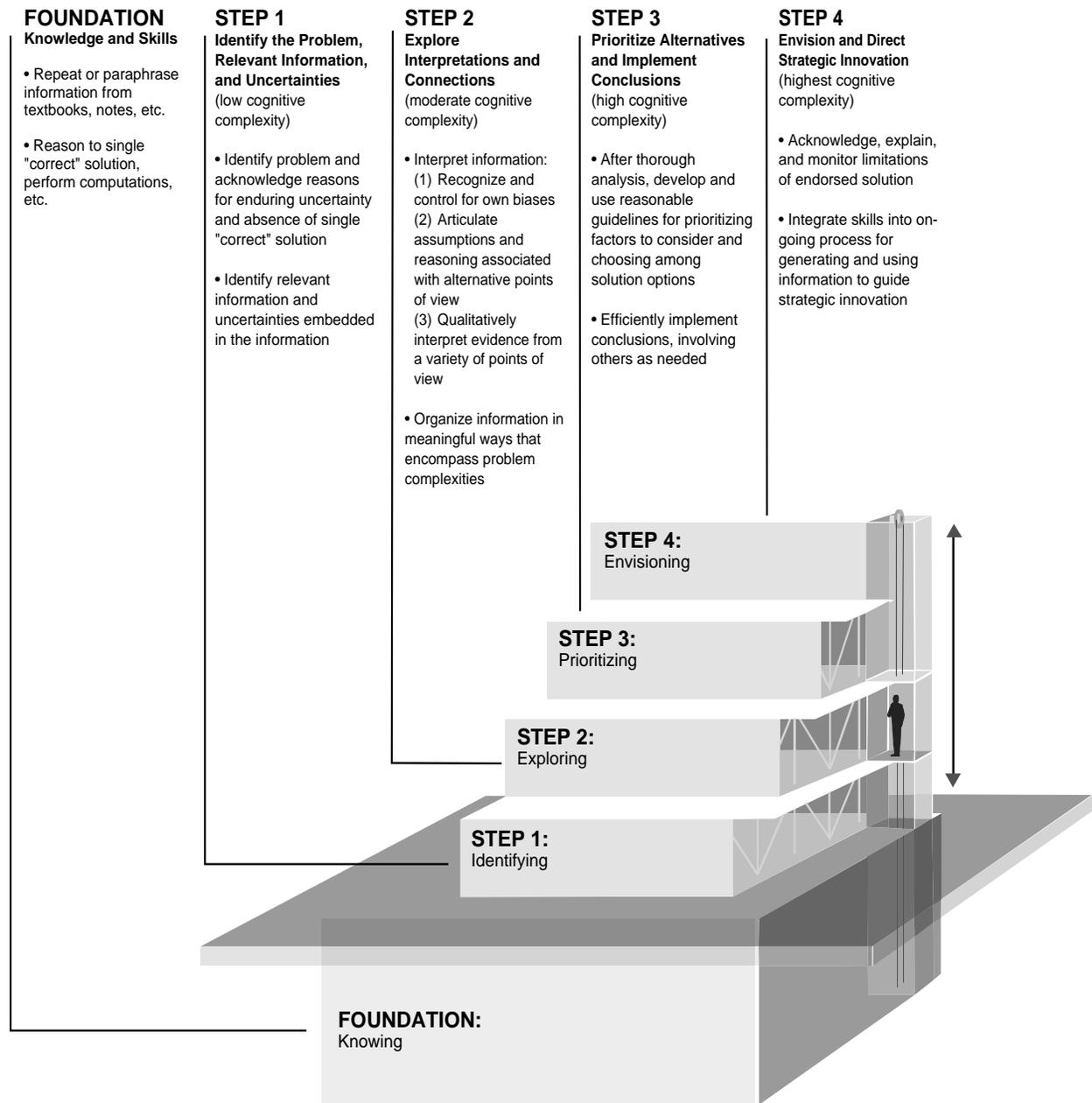
Major improvements over Performance Pattern 3:

- Prioritizes and addresses limitations effectively
- Interprets and re-interprets bodies of information systematically over time as new information becomes available
- Exhibits a strategic, long-term vision
- Spontaneously considers possible ways to generate new information about the problem

Exhibit 2.5

The Strategic Re-Visioner: Performance Pattern 4

Fully Constructed Steps for Better Thinking



The Strategic Re-Visioner exhibits an ability to integrate Step 1, 2, and 3 skills into an ongoing inquiry process described as Step 4. He acknowledges the limitations of his proposed problem solutions in a realistic way, easily applies a wide array of knowledge to complex problems, excels at strategic planning and continuous improvement processes, and can take the “long view.” He is likely to be on the leading edge of his profession because he can design practical research projects to generate useful new knowledge, and he can recognize or create opportunities that others don’t.

A person who can exhibit Performance Pattern 4 does not always operate at this level. Sometimes we consciously choose to truncate the problem solving process for pragmatic reasons. Sometimes we are unable to access our most complex skills due to fatigue, environmental distractions, or other barriers to optimal performance. If we have these skills, however, we are more likely to be successful in addressing open-ended problems than those whose skills are not so well developed.

Classroom Vignette: The Strategic Re-Visioner

Professor Schuler had no reservation about writing a glowing letter of recommendation for this student. “Sandy is the rare student who not only understands engineering technical knowledge, but also performs superior analyses, recognizes and incorporates the most important issues, and always seeks to learn more,” he wrote.

Beliefs That Motivate the Strategic Re-Visioner

The Strategic Re-Visioner holds a number of beliefs that motivate him to think complexly when addressing problems. Following are the most important of these beliefs (adapted from Stage 7 in Kitchener & King, 1985/1996, and King & Kitchener, 1994):

- Learning is a life-long process, and generalized principles of inquiry (like those outlined in Steps for Better Thinking) can be employed in that process
- As a result of careful inquiry and knowledge building over the course of a single lifetime and across generations, substantial improvements can be made in quality of life and professional practice
- Taking reasonable risks associated with moving toward desired changes is necessary

Overview of Performance Patterns

An overview of these five performance patterns is presented in Exhibit 2.6 (also in Appendix A, p. A-3). As discussed further in Chapter 4, you can use this as a simple rubric for evaluating student performance. More detailed rubrics are presented in Chapter 4 along with guidelines for assessment. Chapter 4 also provides examples of the distribution of performance patterns among college students.

To help you more fully understand the differences among these various performance patterns, consider the following classroom assignment and prototypic responses.

Exhibit 2.6 Steps for Better Thinking Performance Patterns

←Less Complex Performance Patterns		More Complex Performance Patterns→		
“Confused Fact-Finder” Performance Pattern 0 Step 1, 2, 3, & 4 skills weak	“Biased Jumper” Performance Pattern 1 Step 2, 3, & 4 skills weak	“Perpetual Analyzer” Performance Pattern 2 Step 3 & 4 skills weak	“Pragmatic Performer” Performance Pattern 3 Step 4 skills weak	“Strategic Re-Visioneer” Performance Pattern 4 Strategically Integrates Step 1, 2, & 3 skills
<p>Overall Problem Approach: Proceeds as if goal is to find the single, “correct” answer</p>	<p>Overall Problem Approach: Proceeds as if goal is to stack up evidence and information to support conclusion</p>	<p>Overall Problem Approach: Proceeds as if goal is to establish a detached, balanced view of evidence and information from different points of view</p>	<p>Overall Problem Approach: Proceeds as if goal is to come to a well-founded conclusion based on objective comparisons of viable alternatives</p>	<p>Overall Problem Approach: Proceeds as if goal is to construct knowledge, to move toward better conclusions or greater confidence in conclusions as the problem is addressed over time</p>
<p>Common Weaknesses:</p> <ul style="list-style-type: none"> ● Fails to realistically perceive uncertainties/ambiguities ● Does not seem to “get it”; recasts open-ended problem to one having a single “correct” answer ● Insists that professors, textbooks, or other experts should provide “correct” answer ● Expresses confusion or futility ● Uses illogical/contradictory arguments ● Cannot evaluate or appropriately apply evidence ● Inappropriately cites textbook, “facts,” or definitions ● Concludes based on unexamined authorities’ views or what “feels right” 	<p>Major Improvements Over Performance Pattern 0:</p> <ul style="list-style-type: none"> ● Acknowledges existence of enduring uncertainties and the viability of multiple perspectives ● Begins to use evidence logically to support conclusions <p>Common Weaknesses:</p> <ul style="list-style-type: none"> ● Jumps to conclusions ● Stacks up evidence quantitatively to support own view and ignores contrary information ● Equates unsupported personal opinion with other forms of evidence ● Inept at breaking problem down and understanding multiple perspectives ● Insists that all opinions are equally valid, but ignores or discounts other opinions ● Views experts as being opinionated or as trying to subject others to their personal beliefs 	<p>Major Improvements Over Performance Pattern 1:</p> <ul style="list-style-type: none"> ● Presents coherent and balanced description of a problem and the larger context in which it is found ● Identifies issues, assumptions, and biases associated with multiple perspectives ● Attempts to control own biases ● Logically and qualitatively evaluates evidence from different viewpoints <p>Common Weaknesses:</p> <ul style="list-style-type: none"> ● Unable to establish priorities for judging across alternatives ● Reluctant to select and defend a single overall solution as most viable, or provides inadequate support for solution ● Writes overly long paper in attempt to demonstrate all aspects of analysis (problems with prioritizing) ● Jeopardizes class discussions by getting stuck on issues such as definitions 	<p>Major Improvements Over Performance Pattern 2:</p> <ul style="list-style-type: none"> ● After thorough exploration, consciously prioritizes issues and information ● Articulates well-founded support for choosing one solution while objectively considering other viable options ● Conclusion based on qualitative evaluation of experts’ positions or situational pragmatics ● Effectively incorporates others in the decision process and/or implementation <p>Common Weaknesses:</p> <ul style="list-style-type: none"> ● Conclusion doesn’t give sufficient attention to long-term, strategic issues ● Inadequately identifies and addresses solution limitations and “next steps” 	<p>Major Improvements Over Performance Pattern 3:</p> <ul style="list-style-type: none"> ● Prioritizes and addresses limitations effectively ● Interprets and re-interprets bodies of information systematically over time as new information becomes available ● Exhibits a strategic, long-term vision ● Spontaneously considers possible ways to generate new information about the problem <p>Common Weaknesses:</p> <ul style="list-style-type: none"> ● Not applicable

©Wolcott, S. K. (January 26, 2006). *Steps for Better Thinking Performance Patterns* [On-line]. Available: www.WolcottLynch.com. Based in part on information from *Reflective Judgment Scoring Manual With Examples* (1985/1996) by K. S. Kitchener & P. M. King. Grounded in dynamic skill theory (Fischer & Bidell, 1998; Fischer & Pruyne, 2002).

(This exhibit can be downloaded under “Educator Resources” at www.WolcottLynch.com.)

Assignment: Reliability of Internet Information

Access the following two Internet sites which provide information about the bone disease osteoporosis:

- Medicinenet.com: <http://www.medicinenet.com/osteoporosis/article.htm>
- Endocrineweb.com: <http://www.endocrineweb.com/osteoporosis/index.html>

Determine which site provides more reliable and useful information for people who are considering the use of a calcium supplement to prevent osteoporosis. Consider how easy each web site is to navigate and understand. Use the criteria at the following Internet site as your evaluation guide for reliability: <http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html>. Your paper should be approximately one page in length.

[Note: The Berkeley library site discussed the following evaluation criteria: the type and source of the URL; information about the author including credentials; the date published; use of footnotes, links to other sites, references, and copyright permissions; completeness of information reproduced from other sources; links to the site from other sources; and overall purpose of the web site.]

Prototypic Responses to the Reliability of Internet Information Assignment

Below are examples of how students displaying different performance patterns might respond to the Internet information assignment. Refer to Exhibit 2.6 to help you focus on the performance patterns as you review these responses.

Confused Fact-Finder—Performance Pattern 0

Medicinenet.com had a link to “Calcium Supplements.” Endocrineweb.com had a link to “The Role of Calcium in the Maintenance of Bone Strength.”

[Note: The response of a Confused Fact-Finder would not always be as short as this one. However, he would have particular difficulty with this assignment because it relies heavily on Step 2 and higher skills and does not involve a topic about which students tend to have preconceived ideas. In this situation, the Confused Fact-Finder might have little to say.]

Biased Jumper—Performance Pattern 1

I logged on to the Endocrineweb site and found a lot of useful information. It was easy to read and included a list of topics. When I clicked on the calcium link, I learned how calcium makes bones strong. I also found a table showing the amount of calcium people should take, referenced to the National Institutes of Health Consensus Panel, Optimal Calcium Intake, 1994. The calcium page is copyrighted by Endocrine Web and the Norman Endocrine Surgery Clinic. Therefore, this web site is reliable and useful for people who are considering the use of a calcium supplement to prevent osteoporosis.

I didn't think the Medicinenet site was very useful. Some people might like this web site because it talks about calcium supplements and its author is Carolyn Janet Crandall, M.D., but the page is cluttered and hard to read. I don't recommend this web site.

Perpetual Analyzer—Performance Pattern 2

The purpose of this paper is to evaluate which web site— Medicinenet.com or Endocrineweb.com— provides more reliable and useful information for people who are considering the use of a calcium supplement to prevent osteoporosis. I used the criteria from <http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html> to evaluate the reliability of information for each web site. In addition, I used my own perceptions to evaluate how easy it was to navigate and understand each web site.

My evaluation of each site is summarized in the table below:

	Medicinenet.com	Endocrineweb.com
What can the URL tell you?	The URL for both web sites is a commercial business (.com), which could mean that the information is biased for a particular company. Medical information from a nonprofit organization (.org) might be less biased and, therefore, more reliable.	
Who wrote the page? What are the author's credentials on this subject?	The domain is owned by MedicineNet.com, which is an online healthcare media publishing company. The company is a network of physicians and other allied professionals, which includes an editorial board of 8 specialists and 67 authors. The author of the osteoporosis pages (including the calcium supplements page) is Carolyn Janet Crandall, M.D., M.S., F.A.C.P. The web site provides her credentials and indicates that she specializes in internal medicine and women's health, which might include concerns about bone loss because of the high incidence of osteoporosis among women. However, Dr. Crandall might not be a specialist in that area. The calcium page also lists two editors, who presumably reviewed the page content, increasing the information's reliability. One editor specializes in internal medicine and gastroenterology, while the other specializes in internal medicine and rheumatology.	The domain is owned by Dr. James Norman, M.D., F.A.C.S. The page containing information about calcium supplements is copyrighted by Endocrine Web and the Norman Endocrine Surgery Clinic. According to the site, Dr. Norman is "one of world's foremost experts on parathyroid disease and one of the best and most experienced parathyroid surgeons in the world." The site provides his credentials as well as statistics for the Norman Endocrine Surgery Clinic. Based on this information, Dr. Norman appears to be an expert on surgery for parathyroid disease. The web site states that the parathyroid glands control calcium levels and that parathyroid disease can lead to osteoporosis, suggesting that Dr. Norman is an expert on calcium and its relationship to osteoporosis. However, the clinic treats only parathyroid disease, so Dr. Norman might not be an expert on the use of calcium supplements for people who do not have that disease.
Is the page dated? Is it current enough?	Both the osteoporosis page and the calcium supplements page were copyrighted 1996-2006, suggesting that the information is current. However, this does not necessarily mean that all of the content on those pages has recently been updated and reviewed.	The osteoporosis page was copyrighted 1997-2005, but the calcium supplements page was copyrighted 1997-2002. Thus, the calcium information has not been updated since 2002 and might be out of date. However, it is possible that no new information about calcium supplements has become available since 2002.
Are sources documented with footnotes or links? Is reproduced information complete, not altered, not fake or forged? Are there links to other resources on the topic?	The web site provides many links and references to outside sources, including other medical web sites and medical research articles. However, the calcium supplements page provides recommended calcium intake for various groups of people, based on the National Institutes of Health Consensus Conference on Osteoporosis without providing a more explicit reference. The recommendations match those on the Endocrineweb.com site, so I assume that they are current (see discussion in the next column). The osteoporosis page also includes a side bar with links to "Topics Related to Osteoporosis," helping the reader locate all relevant information within the MedicineNet.com web site. This web site includes some advertisements by other medical web sites (e.g., WedMD.com) and by specific drugs (e.g.,	The web site provides very few links or references to outside sources. Sometimes research findings are presented with no reference to the source. The calcium supplements page also provides an in-text link to a page within Endocrineweb.com that provides more information about Citracal, a brand of calcium supplement. In addition, the bottom of each page within Endocrineweb.com includes logos for Mission Pharmaceutical (the owner of Citracal) and Citracal, and several pages contain a link at the bottom called "More About Citracal." It appears that the Endocrineweb.com site might be sponsored by or otherwise connected financially to Citracal, which raises questions about possible bias. However, on the calcium supplements page the data for recommended calcium intake is referenced to the National

	Actonel), raising questions about the site's objectivity. However, the information in the site appears to be balanced and does not seem to promote any particular products. For example, the calcium supplements page provides information about amounts of elemental calcium for multiple products: Caltrate, Os-Cal and Tums.	Institutes of Health Consensus Panel, Optimal Calcium Intake, 1994. I conducted a search on the web and located this report (see http://www.niams.nih.gov/hi/topics/osteoporosis/calsum.htm). The 1994 consensus report appears to be the more recent set of recommendations, and the data presented on the Endocrineweb.com site agrees with the report. Assuming that the governmental report is reliable, then the Endocrineweb.com calcium recommendations are also reliable.
What do others say?	According to Alexa.com (part of Amazon.com), 1,219 other sites are linked to Endocrineweb.com, and the site has been online since 1995. Based on the list of other sites visited by people who visit Endocrineweb.com, most visitors appear to be interested in general health questions.	According to Alexa.com (part of Amazon.com), 138 other sites are linked to Endocrineweb.com, and the site has been online since 1998. Based on the list of other sites visited by people who visit Endocrineweb.com, most visitors appear to be primarily interested in Endocrinology (rather than calcium supplements or osteoporosis).
	I generated a report on Alexa.com to compare the "daily reach," or number of viewings per day for the two web sites. Over the past six months, the reach of Endocrineweb.com averaged about one per million users per day, while the reach of MedicineNet.com averaged about 400 per million users per day. Thus, the MedicineNet.com site is viewed far more often, suggesting that it is considered a more useful and reliable site. However, these data are for the entire sites, which include information about medical conditions other than osteoporosis. Because the MedicineNet.com site covers many more medical conditions, one would expect it to have more viewing hits than Endocrineweb.com.	
Does it all add up?	The stated purpose of MedicineNet.com is to provide "easy-to-read, in-depth, authoritative medical information for consumers via its robust, user-friendly, interactive web site." This purpose is consistent with my experience while reviewing the site.	The stated purpose of the web site is "for the education of patients and their families," and the style of presentation and content seem to be consistent with this purpose.
Was the site easy to navigate and understand?	This site was very easy to navigate and understand. Although it sometimes used medical terminology that might be confusing to readers, the links within the site provided additional explanations.	This site was very easy to navigate and understand. The language was fairly easy to follow.
<p>In conclusion, the MedicineNet.com site appears to provide more reliable and useful information for people who are considering the use of a calcium supplement to prevent osteoporosis.</p> <p><i>Pragmatic Performer—Performance Pattern 3</i></p> <p>I evaluated two web sites, Medicinenet.com and Endocrineweb.com, to determine which site provides more reliable and useful information for people who are considering the use of a calcium supplement to prevent osteoporosis. Both sites appear to be sponsored by medical doctors with at least satisfactory credentials and they both provide calcium supplement recommendations from the National Institutes of Health, so the information on both sites is probably fairly reliable. However, information on the Medicinenet.com site appears to be reviewed by a medical editorial board, includes more links to outside sources, and is also more comprehensive. Thus, the information on Medicinenet.com might be more reliable than on Endocrineweb.com. On the other hand, Endocrineweb.com uses simpler language and is a little easier to navigate. These factors are relevant because some people have difficulty navigating the Internet or are unable to understand technical material. Overall, I would say that the choice between these two sites depends on the person who plans to access the information. The Endocrineweb.com site would be better for someone who has less Internet experience or who has difficulty reading technical material, while the Medicinenet.com would be better for a more experienced Internet user who is comfortable reading more detailed medical information.</p>		

Strategic Re-Visioner—Performance Pattern 4

This paper presents my analyses to determine whether Medicinenet.com or Endocrineweb.com provides more reliable and useful information for people who are considering the use of a calcium supplement to prevent osteoporosis. Before analyzing the two web sites, I first explore two alternative reasons why someone might seek information about calcium supplements and osteoporosis on the Internet. Then, given these alternatives uses, I analyze the web sites and provide recommendations.

Why would a person seek information about calcium supplements for prevention of osteoporosis on the Internet? One possibility is that the person plans to take a calcium supplement, but is unsure about the recommended dosage. Another possibility is that the person is concerned primarily about learning more about the prevention of osteoporosis. Due to space and time limitations for this assignment, I will restrict my analysis to only these two possibilities.

For the person interested in recommended calcium dosages, either web site might be appropriate because they both provide recommendations based on The National Institutes of Health (NIH) Consensus Panel, which is also available directly from NIH at consensus.nih.gov/1994/1994OptimalCalcium097html.htm. However, the Medicinenet.com site also provides information about the efficacy and side effects for different forms of calcium, and the information appears to undergo a medical expert editorial process that should increase its reliability. Therefore, I would recommend that site because it provides reliable information that is more complete than the information on Endocrineweb.com.

For the person concerned primarily with learning more about the prevention of osteoporosis, I would once again recommend Medicinenet.com over Endocrineweb.com. The Medicinenet.com web site provides a more complete description of osteoporosis and various treatments. More importantly, this site provides references to other web sites and to health news stories and research articles, facilitating more thorough research. I would also recommend using other sources of information to learn still more about osteoporosis and to uncover possible discrepancies in recommendations among medical experts. Three potential sources would be the 2000 NIH consensus report titled, “Osteoporosis Prevention, Diagnosis, and Therapy” (available at consensus.nih.gov/2000/2000Osteoporosis111html.htm); the 2004 Surgeon General’s report titled, “Bone Health and Osteoporosis” (available at www.surgeongeneral.gov/library/bonehealth/); and the web site of National Osteoporosis Foundation (NOF), a nonprofit organization (available at www.nof.org/). In addition, to ensure becoming informed about new research or recommendations regarding osteoporosis, I would suggest either conducting periodic research or subscribing to publications such as those offered by NOF.

Why Do We Observe These Performance Patterns?

An Introduction to Dynamic Skill Theory

The performance patterns discussed in the preceding pages are grounded in what we know about adolescent and adult development. The prototypic descriptions are well documented (e.g., King & Kitchener, 1994; Kitchener, Lynch, Fischer, & Wood, 1993; Wolcott & Lynch, 1997). This progression in the development of professional competencies can be explained by dynamic skill theory (Fischer & Pruyne, 2002; Fischer & Bidell, 1994; Kitchener & Fischer, 1990).

The mental model presented here is not a static stage theory of human development. Instead, it is a dynamic systems perspective that better captures “the deep complexity, relationships, and dynamism inherent in behavioral, mental, and social phenomena” (Fischer & Bidell, 1998, p. 471). Dynamic skill theory is an elegant model that explains orderly patterns in how skills become increasingly complex. In describing how skills are exhibited in practice, dynamic skill theory takes into account variations associated with “changes in key dimensions of person, body, task, context, and culture” (Fischer & Bidell,

1998, p. 468). Three principles of constructive dynamics provide the foundation for understanding critical thinking development: hierarchical progression, developmental context, and developmental range.

Hierarchical Progression

Skills can be thought of as psychological structures that represent organizational patterns. A hierarchical progression of skills is illustrated from bottom to top in Steps for Better Thinking (Exhibit 2.5). As students and professionals mature, less complex psychological structures are coordinated and integrated to allow more complex thought processes. Thus, less complex skills are necessary precursors to more complex skills, and we see a hierarchical progression in competency development.

Less complex skills are necessary precursors to more complex skills.

Exhibit 2.7 presents one way of visualizing this hierarchical progression. First, simple skills represented by single dots can be identified and sorted dichotomously (Performance Pattern 1). Then these skills are coordinated into a more complex type of skill, which is represented by two connected dots (Performance Pattern 2). Even more complex skills, represented by a square that encompasses several of the connected dots, are built when Performance Pattern 2 skills are coordinated (Performance Pattern 3). Coordinating Performance Pattern 3 skills leads to even more complex skills, represented by a three-dimensional box (Performance Pattern 4). The following paragraphs describe the hierarchical progression of Steps for Better Thinking.

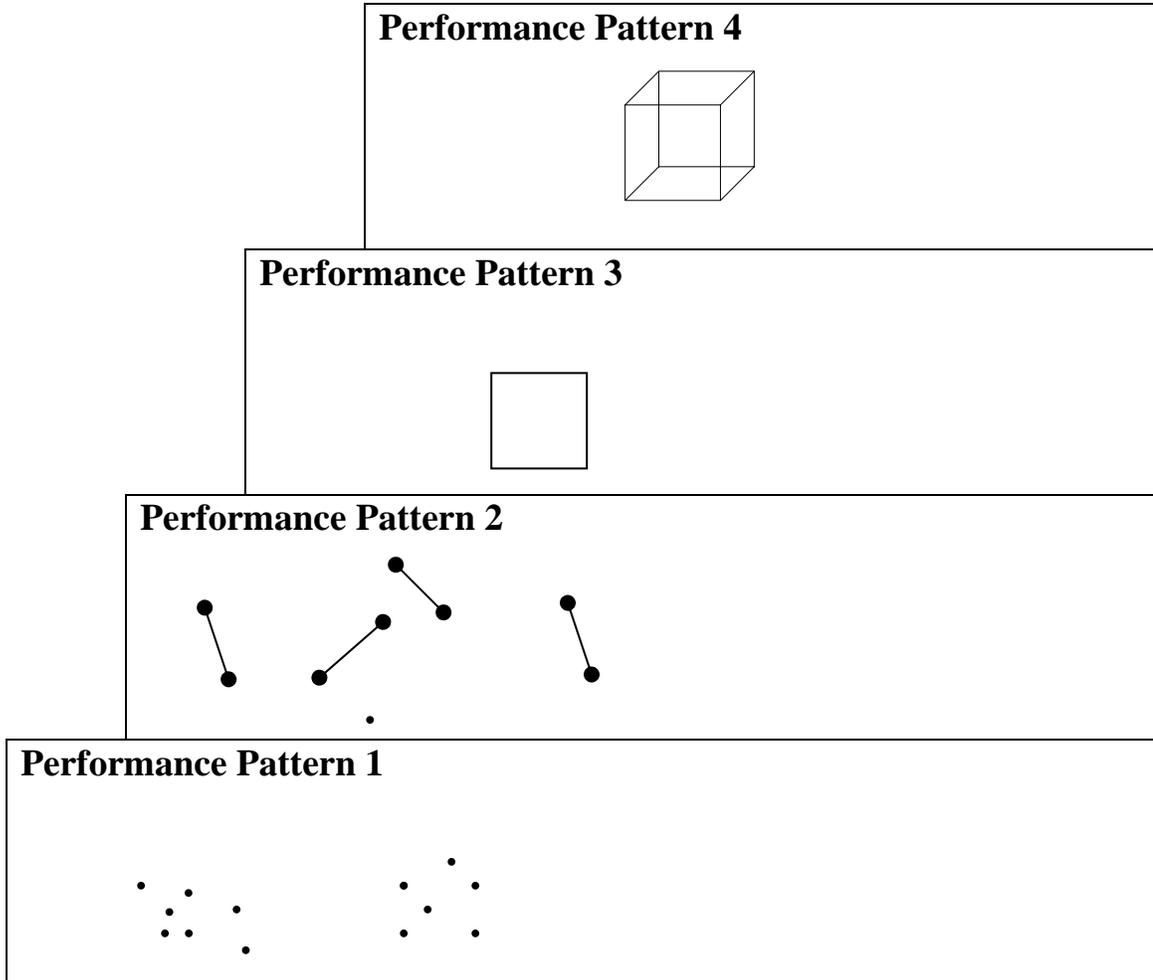
Foundation Skills and Knowledge

A foundation of knowledge and skills is illustrated at the base of Steps for Better Thinking (Exhibit 2.5). This corresponds with concrete representational systems skills in dynamic skill theory (Fischer & Bidell, 1998, p. 539). With these skills, students understand specific logical ideas that represent physical phenomena and can learn to reason to correct solutions in a variety of contexts. For example, children can learn how to manipulate numbers with mathematical computations and eventually they can learn to reason to correct solutions about relatively simple if-then statements (for example, if I live in Kentucky and Kentucky is in the United States, then I live in the United States). However, they have difficulty with abstract, hypothetical thought that encompasses enduring uncertainties.

Step 1: Identify the Problem, Relevant Information, and Uncertainties

Step 1 in Steps for Better Thinking represents skills associated with the use of “single abstractions.” An abstraction is “an idea that refers to something that is intangible, not concrete” (Fischer & Lazerson, 1984, p. 672). In cognitive and language development, to abstract means “to identify a characteristic, rule, or action that is common to a number of objects, events, words, or sentences” (Fischer & Lazerson, 1984, p. 672). Students who can use single abstractions can “coordinate concrete [representational] knowledge of how different people draw different conclusions, based on their own circumstances or 'biases.' From this coordination emerges the abstraction that knowledge is uncertain” (Kitchener & Fischer, 1990, p. 55). This skill allows students to distinguish between a problem that calls for a single, correct answer and an open-ended problem that is fraught with significant and enduring uncertainties. Students who exhibit Step 1 skills also are able to identify relevant information and stack up reasons and evidence to support their opinions about open-ended problems (i.e., the sorting of information into two stacks as shown in Exhibit 2.7). In a complex, ever changing, information rich world, the ability to use abstractions is required to categorize information conceptually and deal more effectively with a wide range of problems, including problems that do not have single, correct answers.

Exhibit 2.7 Hierarchical Progression of Skills



Adapted from Fischer (1980, p. 490).

Step 2: Explore Interpretations and Connections

Step 2 in Steps for Better Thinking represents skills associated with the use of “abstract mappings.” Abstract mapping skills allow a person to relate abstractions to each other. For example, an argument and the context in which the argument is put forth can be considered simultaneously (Kitchener & Fischer, 1990, p. 51). These complex skills allow a person to understand situations and different reasoning strategies more objectively than Step 1 skills and are a necessary precursor for Step 3 skills.

Step 3: Prioritize Alternatives and Implement Conclusions

Step 3 in Steps for Better Thinking represents skills associated with the use of “abstract systems.” These very complex cognitive processes involve coordinating several sides or contexts for justification (Kitchener & Fischer, 1990, p. 55). This coordination allows one to generate guidelines that overarch potentially viable solutions to open-ended problems and provide a basis for prioritizing alternatives.

Step 4: Envision and Direct Strategic Innovation

Step 4 in Steps for Better Thinking represents skills associated with the use of systems of abstract systems (Kitchener & Fischer, 1990) or what Fischer and Bidell (1998) call principles. The general principle evident at this stage is that constructing knowledge is an ongoing process.

Developmental Context

A *context* is the setting in which someone behaves, thinks, and feels; it includes external forces such as physical surroundings, social institutions and cultural factors, and other people. Humans learn skills within a specific context. College students construct critical thinking skills over time as they practice dealing with open-ended problems. Powerful learning environments provide developmentally appropriate challenges and support for students as they engage in meaningful activities. More detailed information about designing powerful learning environments, or developmental contexts, is provided in Chapter 3.

Developmental Range

A person's *developmental range* is “the interval between a person's highest [or most complex] performances with and without social contextual support” (Fischer & Bidell, 1998, p. 483). Individuals do not operate at a single skill level. Rather, individuals operate at multiple skill levels, referred to as that individual's developmental range. In contexts that provide little support for optimal performance, students exhibit less complex performance than they do in contexts that provide substantial support (Kitchener, Fischer, Lynch, & Wood, 1993). In addition, performance often spans two performance patterns (columns in Exhibit 2.6). For example, a student might exhibit some characteristics of the Biased Jumper and some characteristics of the Perpetual Analyzer. It is rare, however, to see examples of performance that span more than two performance patterns.

Accounting educators who are aware of these three principles—hierarchical progression, developmental context, and developmental range—can interpret data about student performance in more meaningful ways and more deliberately devise strategies to help students develop their competencies, as addressed further in Chapters 3 and 4.

Chapter 2 References

- Fischer, K. W. (1980). A theory of cognitive development: The control and construction of hierarchies of skills. *Psychological Review*, 87, 477-531.
- Fischer, K. W., and Bidell, T. R. (1998). Dynamic development of psychological structures in action and thought. In R. M. Lerner (Ed.) and W. Damon (Series Ed.), *Handbook of child psychology. Vol. 1: Theoretical models of human development* (5th ed., pp. 467-561). New York: Wiley.
- Fischer, K. W., and Lazerson, A. (1984). *Human development from conceptual through adolescence*. New York: W. H. Freeman.
- Fischer, K. W., & Pruyne, E. (2002). Reflective thinking in adulthood: Development, variation, and consolidation. In J. Demick & C. Andreoletti (Eds.), *Handbook of Adult Development* (pp. 169-197). New York: Plenum.
- King, P. M., and Kitchener, K. S. (1994). *Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults*. San Francisco: Jossey-Bass.
- Kitchener, K. S., & Fischer, K. W. (1990). A skill approach to the development of reflective thinking. In D. Kuhn (Ed.), *Contributions to human development: Vol. 21. Developmental perspectives on teaching and learning* (48-62). Basel, Switzerland: Karger.
- Kitchener, K. S., and King, P. M. (1985/1996). *Reflective judgment scoring manual with examples*.
- Kitchener, K. S., Lynch, C. L., Fischer, K. W., and Wood, P. K. (1993). Developmental range of reflective judgment: The effects of contextual support and practice on developmental stage. *Developmental Psychology*, 29, 893-906.
- Wolcott, S. K., and Lynch, C. L. (1997). Critical thinking in the accounting classroom: A reflective judgment developmental process perspective. *Accounting Education: A Journal of Theory, Practice and Research*, 2(1), 59-78.

Suggested Professor Activities

The following activities are designed to help you reflect upon and implement the ideas presented in this chapter. You may wish to engage in these activities individually or with colleagues.

1. Re-read the Classroom Vignette on page 2-1 in this chapter, which describes Professor Chow's observations of her students. Refer to the performance patterns in Exhibit 2.6. Which performance pattern represents the students who “reacted negatively” to the introduction of ambiguity in sociology? Which performance patterns represent the students who could “discuss alternative interpretations of empirical observations”?
2. Identify an open-ended problem that you use or could use in one of your courses. Write a paragraph explaining why it is an open-ended problem. Consider how students might learn about the issues you included in your paragraph.
3. Re-read the descriptions of the performance patterns in Exhibit 2.6. Do you recognize any of your own students? What documentation do you have about the skills of students in your course or program?
4. Think about the students who perform best in one of your courses. Can you identify evidence that suggests they:

- a. Understand uncertainties related to open-ended problems, and
 - b. Can look at a problem from different points of view?
5. Think about students who struggle with assignments that address open-ended problems in your courses. Do you know whether or not they grasp the open-ended nature of those problems? Can they articulate why experts disagree about the best solution to open-ended problems?

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Chapter 3

Designing Coursework to Foster Critical Thinking Development

This chapter:

- Offers suggestions for educational activities aimed at a wide range of critical thinking skills;
- Explains how to address the developmental needs of students operating at diverse performance patterns;
- Provides templates for designing assignments;
- Offers suggestions for using Steps for Better Thinking with students, grading critical thinking performance, and supporting better student performance; and
- Offers a to-do list to help professors begin to adopt a developmental approach.

Building Critical Thinking Skills

In her comprehensive monograph on critical thinking, Kurfiss (1988, p. 4) pointed out that professors often assign tasks that require critical thinking skills, but leave the acquisition of such skills to the student's "ingenuity, good fortune, and native ability." When designing coursework assignments, professors commonly make the following mistakes:

- The professor overestimates student skills and assigns coursework that is unreasonably complex. This approach tends to hinder student development because students are overwhelmed.
- The professor becomes frustrated with students' inability to think complexly and assigns low complexity coursework. This approach fails to encourage student development because students are inadequately challenged.

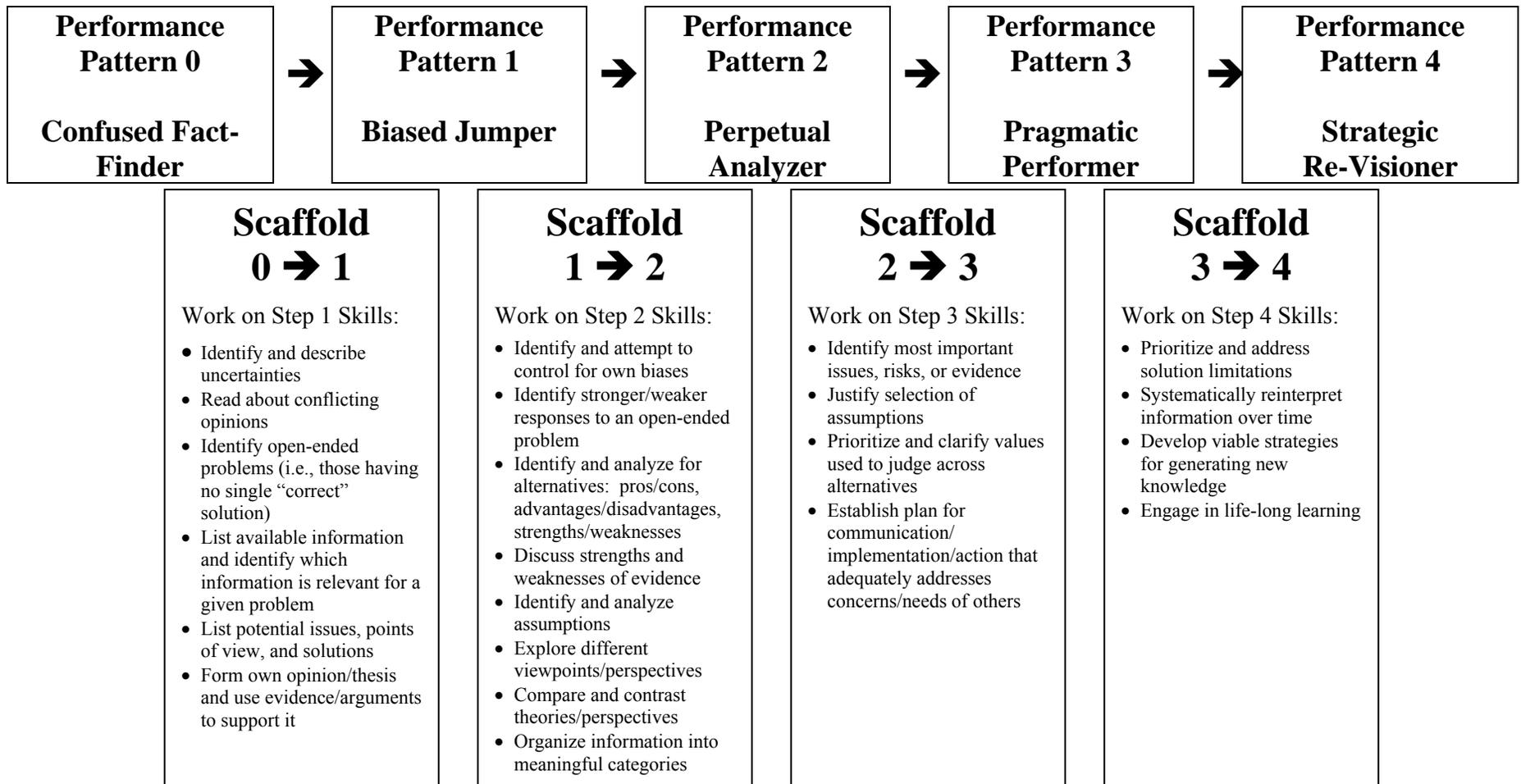
Instead of asking students to develop critical thinking on their own, educators must create educational environments to more deliberately help students build those skills. As illustrated in Exhibits 1.5 and 1.6 (Chapter 1), student achievement will be greater when the educational environment is more closely aligned with desired learning outcomes and student characteristics. To improve student achievement, educators need to design assignments to "start where students are" and then guide them toward reasonable critical thinking outcomes.

Chapter 2 described prototypical performance patterns in addressing open-ended problems. Exhibit 3.1 summarizes the types of skills that are likely to promote improved critical thinking for each performance pattern. The goal is to scaffold the development of skills for the next level in Steps for Better Thinking (Appendix A, p. A-2). For example, students who currently operate at Performance Pattern 1 (the Biased Jumper) need to focus primarily on Step 2 skills.

Working With the Confused Fact-Finder to Foster Step 1 Skills

Review the characteristics of the Confused Fact-Finder (Performance Pattern 0; see Chapter 2 and Appendix A, p. A-3). Without an adequate understanding of the Confused Fact-Finder, professors who ask him to perform critical thinking tasks may be frustrated by the apparent illogic of his arguments and by his ineptitude in addressing complex problems.

Exhibit 3.1 Learning Activities to Scaffold the Next Level of Performance



Steps 1, 2, 3, and 4 refer to Steps for Better Thinking (Appendix A, p. A-2)

While his professors are frustrated by his poor performance, the Confused Fact-Finder is probably frustrated and confused because he does not understand why he is being asked to make a judgment. He is easily overwhelmed by the complexity of issues in open-ended problems. He may wonder why the professor fails to provide the “right” answer, and he might become frustrated because he believes the professor is hiding information. He may argue that the subject has been unnecessarily complicated and that complex problems should be relegated to higher-level courses.

The Confused Fact-Finder is likely to exhibit very poor performance if professors assign him tasks that require much higher levels of cognitive complexity. For example, he might list definitions when asked to compare and contrast two theories (a task which requires Step 2 skills). Instead, he should be given learning activities that require him to practice and develop Step 1 skills. Below are descriptions of learning activities that focus on those skills.

Learning Goal 3.1: Identify and Describe Uncertainties.

Professors might tend to overlook the need to have students explicitly identify and describe uncertainties. As experts in their fields, professors tend to view this skill as “obvious.” However, keep in mind that the Confused Fact-Finder *believes* that uncertainty either does not exist or is merely temporary. He holds an unrealistic view of the world. Perhaps the most important growth opportunity for the Confused Fact-Finder is for him to learn that true ambiguity exists. Using assignments such as the one shown in the box below, students should be exposed to and asked to address uncertainties associated with:

- Describing the problem accurately and completely,
- The range of potential solution options,
- The completeness of the available information and the availability of new information in the future,
- The best way to use and interpret the available information,
- The potential outcomes of various solutions, and
- Whether and how conditions related to the problem might change.

The Confused Fact-Finder is likely to develop this skill slowly. Students first learn to identify only the most obvious uncertainties such as a lack of information or inability to predict the future. Over time, with adequate challenges, support, and practice, students can learn to discuss uncertainties more complexly.

One-Paragraph Assignment: Identify and Describe Uncertainties

Ask students to write one paragraph on a question addressing uncertainties about aspects of a homework problem or a course topic. Examples:

- Why don't we know with certainty what [the author of a piece of literature or other writing] intended to convey?
- How certain are you that [a theory] adequately explains/describes [a phenomenon]?
- Why don't we know with certainty whether [one theory/hypothesis] or [another theory/hypothesis] better explains/describes [a phenomenon]?
- Why can't [a decision maker] know with certainty which [choice] is best?
- Why does uncertainty exist about whether [a social/business/personal policy or practice] is beneficial?
- Why can't [experts] completely solve [a problem]?

Alternative ways to use this assignment:

- Give students 5 minutes at the end of class to write a paragraph on a question addressing uncertainties about that day’s topic. Quickly review the students’ responses and discuss the results with students at the beginning of the next class.
- Have students write the paragraph as an in-class group activity. The students can help each other explore uncertainties. Have the groups turn in their paragraphs, share and combine their paragraph with another group, or have selected groups share their paragraph with the whole class.
- Add questions about uncertainties to textbook homework assignments (textbooks rarely ask explicit questions about uncertainties).

Comments:

Although aimed primarily at the needs of the Confused Fact-Finder, students having more complex critical thinking skills will still benefit from this learning activity; they will identify more uncertainties and provide more complex explanations.

An added benefit of this activity is that it not only promotes and provides information about students’ critical thinking, but it can also help the professor uncover student misconceptions about the related course content.

Learning Goal 3.2: Acknowledge Conflicting Opinions

Another way to help the Confused Fact-Finder develop a more realistic view of the world is to have him read about conflicting opinions. He tends to believe that differences of opinion are attributable only to dichotomous explanations; people holding different views are seen as good/bad, right/wrong, smart/stupid, etc. The Confused Fact-Finder needs exposure to examples which contradict his beliefs—i.e., situations in which equally knowledgeable and well-meaning people legitimately disagree about an open-ended problem.

Give students a reading assignment which presents conflicting opinions. Alternatively, you may wish to construct a short hypothetical scenario, such as the one shown in the box below, which presents conflicting opinions.

Learning Activity: Conflicting Opinions

The following scenario was written by Susan Wolcott and Charlene Gray.

Responding to a Homeless Man

“Brrrrr, it’s cold outside!” exclaimed Holly as she poured herself a large mug of coffee. “Where did the spring weather go?”

“I don’t know,” answered Karen as she sipped her coffee. “Flowers were blooming in my garden last week, and now it’s cold again. I wish spring would get here and stay!”

Holly and Karen always joined each other for coffee before beginning work. They took this time to engage in casual conversation and also to discuss joint work projects. Karen had just finished a large project, and she was looking forward to a slower pace at work for the next few days.

“Speaking of cold weather,” Karen added, “you won’t believe what happened at my house last night. I

was still working on that Hollings project at about 11 o'clock, when the doorbell rang. John had already gone to bed, so I went to see who was there. It was a homeless man. I was nervous about opening the door to a stranger, particularly at that time of night. But the man was standing with a grocery cart, and I didn't think I was in danger, particularly with my dog barking and growling. So, I opened the door to find out what he wanted. The man told me that he was homeless and that someone had taken his stash of blankets. He said that he saw lights on in my house and thought that maybe I could loan him some blankets for the night. The weather was cold last night, and he looked fragile. I can't imagine what it would be like to be homeless! I asked him to wait on the porch. Then I re-locked the front door and ran upstairs to find some extra blankets. While rummaging in the closet, I also found an old down coat—a mid-calf length, hooded coat that I had been planning to donate to a charity. It would be too small for him, but I think he could use it as ground insulation. When I gave him the blankets and coat, the man was very polite. He thanked me profusely and said that he would bring the things back to me the next day. I told him that he didn't need to do that, that he could keep them. I just can't help but wonder how he's doing. The blankets I gave him weren't enough to keep him warm on the ground at night."

"Wow!" exclaimed Holly. "Now that you've given him something, he is going to be back at your house all the time looking for more handouts. If I were you, I wouldn't have answered the door. People like that should go out and get jobs. They don't appreciate it when you give them things, and they always want more. Just wait. You'll see that man again real soon."

Homework and/or Discussion Questions:

To focus on Step 1 skills, ask students questions such as these: How is it possible that Karen and Holly hold such different views? Why don't we know with certainty whether Karen's or Holly's position about the homeless man is absolutely "correct"? What uncertainties might prevent Karen and Holly from reaching complete agreement about the homeless man?

This scenario could easily be used to address higher-level critical thinking skills, particularly Step 2. See additional question prompts for this scenario in Appendix G.

Learning Goal 3.3: Identify Open-Ended Problems

The Confused Fact-Finder believes that all problems have a single correct solution. After at least some practice identifying uncertainties and considering conflicting opinions, he may be ready to begin distinguishing between well-defined problems that have a single correct solution and open-ended problems that require him to use judgment.

Consider providing students with a copy of Exhibit 3.2, which defines the two types of problems, gives examples, and describes the goal. Or, you may wish to create your own version of this exhibit using examples from the course you are teaching or from your discipline. Discuss this exhibit with your students, and consider combining the discussion with learning activity 3.1, in which you ask students to identify uncertainties related to open-ended problems.

Confused Fact-Finders often spend considerable amounts of time looking in the textbook or their class notes for the "correct" solution to open-ended problems because they do not realize that they are required to use their own judgment. These students can learn to use their time more efficiently and effectively if they first determine whether a particular learning task is open-ended. When introducing a new learning task (a homework assignment, project, etc.), consider one of the following: (a) tell students whether the learning task is well-defined or open-ended, (b) hold a brief class discussion about whether the learning task is well-defined or open-ended, or (c) as part of the assignment ask students to identify and explain whether it is well-defined or open-ended.

Exhibit 3.2 **Well-Defined Versus Open-Ended Problems**

	<u>Well-Defined Problems</u>	<u>Open-Ended Problems</u>
<u>Definition</u>	<p>Can be described with a high degree of <i>completeness</i></p> <p>Can be solved with a high degree of <i>certainty</i></p> <p>Experts usually agree on the correct solution</p>	<p>Cannot be described with a high degree of <i>completeness</i></p> <p>Cannot be resolved with a high degree of <i>certainty</i></p> <p>Experts often disagree about the best solution</p>
<u>Examples</u>	<p>Perform a regression analysis</p> <p>In your own words, define the “self-made man” theory</p> <p>Describe current governmental dietary guidelines</p>	<p>Qualitatively interpret regression results</p> <p>Critique the “self-made man” theory</p> <p>Discuss the pros and cons of current governmental dietary guidelines</p>
<u>Goal</u>	<p>Learn to <i>reason to correct solution</i></p>	<p>Learn to <i>construct and defend a reasonable solution</i></p>

In our cost accounting textbook, Leslie Eldenburg and I adopted a coding scheme in which open-ended questions are flagged with an icon.¹ This coding scheme helps both professors and students quickly recognize which questions require judgment. Identifying and flagging the open-ended questions in your own assignments will help your students approach each assignment more appropriately, and it will also help you consider whether you are assigning a reasonable mix of well-defined and open-ended tasks.

Learning Goal 3.4: List Available Information and Identify Which Information Is Relevant

Sometimes the Confused Fact-Finder is unable to perform tasks as simple as identifying information in a given scenario. Such difficulties may lead to perceptions that he is lazy or has poor reading comprehension. An alternative explanation is that he is overwhelmed by a task or by the complexity or presentation of information. He might list definitions when asked to discuss the strengths and weaknesses of a particular point of view (a task which requires Step 2 skills). Or, he might complain that information is presented differently than in the textbook. The Confused Fact-Finder equates learning with memorizing, so he is confused by information that is presented in a different format. He also assumes that all information presented must be relevant, so he might try inappropriately to use irrelevant information. Sometimes he ignores information that he does not understand.

Consider giving your students tasks, such as Part A in the problem shown in the box below, which require them to list information and then identify which pieces of information are relevant to a given problem. This activity might be performed as an in-class activity in small groups.

Example: Listing Information and Identifying Relevant Information

This homework problem is from Eldenburg & Wolcott (2005, pp. 29-30), copyright by John Wiley & Sons. Presented here with permission.

Janet Baker's Residence Decision

Relevant information, uncertainties, information for decision making Janet Baker is deciding where to live during her second year in college. During her first year, she lived in the residence hall. Recently her friend Rachel asked her to share an off-campus apartment for the upcoming school year. Janet likes the idea of living in an apartment, but she is concerned about how much it will cost.

To help her decide what to do, Janet collected information about costs. She would pay \$400 per month in rent. The minimum lease term on the apartment is six months. Janet estimates that her share of the utility bills will be \$75 per month. She also estimates that groceries will cost \$200 per month. Janet spent \$350 on a new couch over the summer. If she lives in the residence hall, she will put the couch in storage at a cost of \$35 per month. Janet expects to spend \$7,500 on tuition and \$450 on books each semester. Room and board at the residence hall would cost Janet \$2,900 per semester (four months). This amount includes a food plan of 20 meals per week. This cost is nonrefundable if the meals are not eaten.

(continued on the next page)

¹ Because we introduced Steps for Better Thinking in Chapter 1 of the textbook, we decided to use different icons for Steps 1, 2, 3, and 4 (Eldenburg & Wolcott, 2005). Other professors might not want to adopt such a complex coding scheme. Particularly when working with Confused Fact-Finders, it may be sufficient to separately identify open-ended questions from well-defined ones.

Janet Baker's Residence Decision (continued)

REQUIRED: INFORMATION ANALYSIS

The following questions will help you analyze the information for this problem. Do not turn in your answers to these questions unless your professor asks you to do so.

- Ⓒ A. Use ONLY the cost information collected by Janet for the following tasks.
 - 1. List all of the costs for each option. *Note:* Some costs may be listed under both options.
 - 2. Review your lists and cross out the costs that are irrelevant to Janet's decision. Explain why these costs are irrelevant.
 - 3. Calculate and compare the total *relevant* costs of each option.
 - 4. Given the cost comparison, which living arrangement is the better choice for Janet? Explain.
- ① B. Identify uncertainties in the cost information collected by Janet.
 - 1. Determine whether each cost is likely to be (i) known for sure, (ii) estimated with little uncertainty, or (iii) estimated with moderate or high uncertainty.
 - 2. For each cost that is known for sure, explain where Janet would obtain the information.
 - 3. For each cost that must be estimated, explain why the cost cannot be known.
- ① C. List additional information that might be relevant to Janet's decision (list as many items as you can).
 - 1. Costs not identified by Janet.
 - 2. Factors other than costs.
- ② D. Explain why conducting a cost comparison is useful to Janet, even if factors other than costs are important to her decision.
- ② E. Consider your own preferences for this problem. Do you expect Janet's preferences to be the same as yours? How can you control for your biases as you give Janet advice?
- ③ F. Think about what Janet's priorities might be for choosing a housing arrangement. How might different priorities lead to different choices?
- ④ G. Describe how information that Janet gains over this next year might affect her future housing arrangements.

Suppose Janet asks for your advice. Turn in your answers to the following.

REQUIRED: WRITTEN ASSIGNMENT

- ③ H. Use the information you learned from the preceding analyses to write a memo to Janet with your recommendation and a discussion of its risks. Refer in your memo to the information that would be useful to Janet.

Note: Parts A, B, and C of this problem require Step 1 skills. The rest of the problem requires higher-level skills that might not be appropriate for a Confused Fact-Finder.

Learning Goal 3.5: List Potential Issues, Points of View, and Solutions

Before developing more complex analysis skills (Steps 2 and higher), students must first develop the Step 1 skill of identifying relevant information and alternatives. A useful learning activity is to give students one or more readings and have them make lists of potential issues, points of view, and/or alternative solutions. Another activity is to ask small groups of students to brainstorm and create similar lists during class. Select groups can be asked to share their lists with the whole class. The latter activity is particularly useful in classrooms where a significant proportion of students exhibits Confused Fact-Finder characteristics, but where many students operate at Performance Pattern 1 (Biased Jumper) or higher. Students who have already developed Step 1 skills can help the Confused Fact-Finder learn to identify relevant information and alternatives.

Learning Goal 3.6: Form Own Opinion/Thesis and Use Evidence/Arguments to Support It

Although the Confused Fact-Finder is not sophisticated in his use of evidence, professors can lay groundwork for future growth by exposing him to the use of evidence in justifying opinions. Once the Confused Fact-Finder recognizes that he must use his own judgment to address an open-ended problem

and he has developed the ability to identify at least some relevant information, he may be ready to begin using evidence or arguments to support his own opinion/thesis. Initially, students' arguments are likely to contain contradictory statements and may be poorly organized. Here are several ideas for helping students develop these skills:

- Provide students with well-written examples showing the style you would like them to use. First have students read the examples to identify the opinion/thesis and supporting arguments. Then for a different problem, ask students to create a list of arguments, form their own opinion/thesis, and use their list to write their own paper.
- Discuss with students and provide examples of the various types of evidence/arguments that might be used. Evidence/arguments might include facts, descriptions, definitions, opinions, ideas, claims, theories, concepts, observations, statistics, values, perceptions, beliefs, influences, or effects. Also consider discussing with students alternative methods for gathering information such as reading, seeing, hearing, touching, feeling, experiencing, interacting, and thinking.
- Encourage students to brainstorm with other people (such as students in the class) to help them expand the number of issues they consider.
- Lead classroom discussions of open-ended problems and provide students with stronger critical thinking skills articulate ways in which they identify and use evidence. Repeated exposure to a higher level of complexity exhibited by peers can be a powerful source of motivation for the Confused Fact-Finder.
- Provide your students with a guide for thinking and writing argumentative essays or refer them to a web site that walks them through the process. Below are some web sites that might be useful. Caution: Most web sites focus not only on Step 1 skills, but also on Step 2 and higher skills. Remember that the Confused Fact-Finder can become overwhelmed quickly. Scale back the guidance, as needed, to a manageable level for your students.
 - www.bridgewater.edu/~atrupe/ENG315/planning.htm
 - www.webenglishteacher.com/argument.html
 - www.smith.edu/jacobsoncenter/writinghandout2.html
 - wrt.syr.edu/pub/handbook/ArrangementandForm.html
- Professors who teach writing courses usually have considerable experience working with students on these skills. Consider consulting writing professors at your school to learn some of their tips and tricks.

Templates for Designing Developmental Questions Aimed at Step 1 Skills

The following templates might be helpful as you design assignments and conduct classroom discussions aimed at helping students build Step 1 skills. (The templates are combined for Steps 1, 2, 3, and 4 in Exhibit 3.3.)

Question Templates for Step 1 Skills

Identifying Relevant Information:

- List data or types of information relevant to _____
- Identify relevant information in _____ (a textual passage such as a case, article, or piece of literature)

- Identify or access relevant theories, laws, standards, or rules for _____
- Identify factors or issues related to _____
- Identify various potential points of view or solutions to _____
- Describe arguments in favor of _____

Identifying Uncertainties:

- Describe uncertainties concerning _____
- Identify and describe uncertainties about the interpretation or significance of _____
- Identify risks associated with _____
- Describe why there is no single, “correct” way to _____
- Identify reasons why _____ might change or vary

Working With the Biased Jumper to Foster Step 2 Skills

Review the characteristics of the Biased Jumper (Performance Pattern 1; see Chapter 2 and Appendix A, p. A-3). Based on available data (presented in Chapter 4), the majority of students exhibit Biased Jumper characteristics at the time of graduation from an undergraduate program. Many students might fail to move beyond Biased Jumper skills because their educational environment penalizes them for moving toward the next higher level of performance, which is negatively viewed as "wishy-washy relativism" (the Perpetual Analyzer). Assignments and classroom discussions often encourage students to just state and defend their opinions, so they look only for evidence that supports their opinions. Students need encouragement to take the time necessary to develop Step 2 skills and more fully explore open-ended problems. At the same time, the Biased Jumper is likely to exhibit poor performance if professors ask her to perform tasks that are clearly beyond the reach of her cognitive complexity. For example, she may perform abysmally if asked to modify the tone and content of a written communication to meet the needs of a particular audience (Step 3). Instead, she should be given learning activities that require her to practice and develop Step 2 skills. Below are descriptions of learning activities that focus on those skills.

Learning Goal 3.7: Identify and Attempt to Control for Own Biases

The Biased Jumper tends to look at problems superficially, rather than complexly and broadly. She is likely to approach an open-ended problem by stacking up evidence to support her preconceived notions without giving careful consideration to viable alternatives. Alternatively, she may view coursework as a game in which it is her job to figure out what the professor wants and then to stack up evidence to support that position. She often ignores or discounts information that contradicts the position she is taking. The Biased Jumper believes that it is sufficient to simply stack up evidence that supports one’s opinion and may be unaware that this approach is considered to be biased. At the same time, she might readily accuse others of being biased.

Classroom discussions can be quite useful in helping the Biased Jumper recognize her biases. Particularly if she is a traditional-age college student, the Biased Jumper tends to exhibit openness to new information and tolerance for others’ ideas. Thus, she is often interested to learn during class discussions that her peers hold a variety of opinions and have different ways of talking about and interpreting a problem. Below are some techniques that can help students learn to recognize and begin to control for their biases:

- Ask students to research definitions for the term “bias” and to identify biases that other people might hold.

- Conduct classroom discussions about the effects of preferences and preconceived notions when interpreting and using information. [Note: I find that students may be unwilling to admit their “biases,” but are usually willing to discuss their “preferences.”]
- Have students read and identify potential biases in a reading (e.g., an article or a peer’s paper).
- Ask students to brainstorm about ways to (1) identify and (2) control for biases.
- After students have written a paper in which they take a position on an issue, have them write a paper in which they take an opposing position. The Biased Jumper has difficulty with this task; she tends to use pejorative language or otherwise discount the opposing view.
- Embed a question about biases in a larger problem. For an example, see question E in Janet Baker’s Residence Decision on page 3-8.
- Have students read and discuss various parts of Wikipedia’s web site which address biases. For example:
 - Neutrality and bias: en.wikipedia.org/wiki/WP:NPOV#Bias
 - Words to avoid: en.wikipedia.org/wiki/Wikipedia:Words_to_avoid
 - Guidelines for controversial articles: en.wikipedia.org/wiki/Wikipedia:Guidelines_for_controversial_articles
 - Avoid weasel words: en.wikipedia.org/wiki/Wikipedia:Avoid_weasel_words

Learning Goal 3.8: Identify Stronger/Weaker Responses to an Open-Ended Problem

The Biased Jumper tends to sound very democratic, arguing that “everyone is equal.” What she doesn’t understand is that human beings can be viewed ideally as equals, but individual opinions are not necessarily equal. Her democratic tendencies, driven by her inability to recognize qualitative differences among arguments or objectively evaluate her own opinions, sometimes leads her to view professors as “unfair” or “opinionated.” This is most likely to occur when she is challenged about her beliefs or when grades depend on the quality of her arguments.

The Biased Jumper fails to fully understand that experts (including professors) generally reach conclusions through a complex process of identifying and interpreting evidence from a variety of legitimate perspectives. The Biased Jumper needs to work on developing complex skills for exploring open-ended problems and alternative interpretations of relevant information. Professors can begin to foster her development by helping her understand that some opinions or evaluations of information are stronger or weaker than other opinions or evaluations. Here are some learning activities to assist in this development:

- Have students write an essay and/or hold a classroom discussion about the following question: “Why is evaluating an argument different than making a judgment about a person?” The prototypical Biased Jumper believes that different viewpoints arise solely because of personal characteristics (e.g., upbringing, intentional bias, or individualism), so they take criticisms of their work personally. This learning activity is designed to help reduce students’ negative emotional responses to the evaluation of their work.
- Provide students with readings (e.g., student papers or articles) which take the SAME position on an issue, but where one reading provides stronger support than the other. The difference between readings should be qualitative to avoid the Biased Jumper’s tendency to focus only on quantitative factors such as the number of arguments presented. Have students identify which

reading provides stronger support and explain why. It would be best for students to address this task as a homework problem and then address it again in small group and/or whole class discussions.

- Have students perform a task similar to the preceding one, except that the two readings take DIFFERENT positions on an issue. For an example of this type of assignment, see Appendix C (Restrictions on Gender in Educational Settings). The Biased Jumper’s tendency is to argue that the reading with which they agree is the one having stronger support; students who disagree with the stronger argument may be unwilling to recognize its strengths.
- Have students use a rubric² to evaluate the quality of one or two readings (e.g., student papers or web articles). This activity could be combined with one of the preceding two activities. Or, have students evaluate a peer’s paper or self-evaluate their own papers.
- Use a rubric to evaluate and provide feedback on your students’ responses to an open-ended problem. Presenting students with a set of scoring guidelines reduces the Biased Jumper’s tendency to believe that the professor’s evaluation of her work is biased and also provides her with more explicit guidance for ways she can improve her work.

Learning Goal 3.9: Identify and Analyze for Alternatives: Pros/Cons, Advantages/Disadvantages, Strengths/Weaknesses

When asked to identify pros and cons (or advantages/disadvantages or strengths/weaknesses) for alternatives in an open-ended problem, the Biased Jumper tends to recast the question and provide pros for the alternative she prefers and cons for the other alternative(s). Students need substantial practice analyzing and presenting as objectively as possible the pros/cons, advantages/disadvantages, strengths/weaknesses of each alternative in an open-ended problem.

One way to help build this skill is to have students create a table such as the one shown below, in which they much explicitly list both the pros and the cons for each alternative. Students may be asked to construct this table individually as a homework task, and then expand the table during class in small groups. A whole-class discussion might help students complete the table even more.

	Pros/Advantages/Strengths	Cons/Disadvantages/Weaknesses
Alternative/Option/ Viewpoint #1		
Alternative/Option/ Viewpoint #2		
Etc.		

² A *rubric* is a set of scoring guidelines for assessing performance. Examples are provided in Chapter 4.

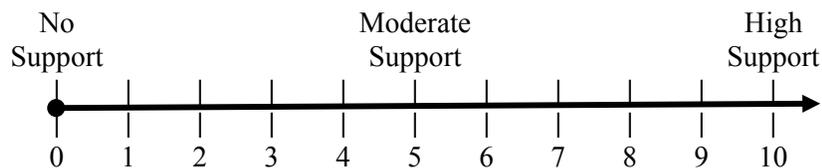
Learning Goal 3.10: Discuss Strengths and Weaknesses of Evidence

The Biased Jumper tends to believe that individual pieces of evidence either support or do not support an argument. They need to learn that some pieces of evidence are stronger than others and that a single piece of evidence might have multiple interpretations. Here are learning activities related to the evaluation of evidence:

- Fully explain your own thought processes in evaluating examples of evidence. [Note: It can be surprisingly difficult for professors to fully describe their own thought processes. Some practice may be necessary before you are able to do this in a way that is comprehensible for your students.]
- Ask questions such as the following about the evidence students use when addressing an open-ended problem: Is this evidence absolutely true/certain? Why or why not? Would everyone agree with the interpretation of this evidence? Why or why not? If this evidence or interpretation is true, then what else must also be true? How could we go about evaluating the quality of this piece of evidence? What makes some evidence stronger or weaker than other evidence?
- Learning activities similar to those described above for goals 3.8 and 3.9 can be used to help students evaluate the strengths and weaknesses of individual pieces of evidence. In addition, you can help students practice evaluating the degree to which evidence supports an argument by conducting the activity shown in the box below.

Learning Activity: Evaluating the Support of Evidence

Present students with one or more pieces of evidence related to an argument, or have students identify pieces of evidence. Evidence might take a variety of forms, including facts, opinions, ideas, claims, theories, concepts, observations, statistics or other data, values, perceptions, or beliefs. For each piece of evidence, ask students to indicate on the line below how much support the evidence provides for the argument, and have them explain the reasons for their choices. Also ask students to evaluate the degree of support for all of the evidence taken together. Hold small or large group discussions about the students' choices.



Learning Goal 3.11: Identify and Analyze Assumptions

The identification and analysis of assumptions are difficult skills to develop. The Biased Jumper is likely to begin developing this skill more readily when focusing on other peoples' rather than her own assumptions. Below are several learning activities to help develop these skills.

- Ask students to research definitions for the term “assumption” and to explain why assumptions are needed. Here is a possible definition and explanation: Assumptions are hypotheses, suppositions, conjectures, assertions, presumptions, beliefs, or premises that are taken for granted or that lie behind an argument. Assumptions are made because of uncertainties; the “truth”

cannot be known or proven. Also consider asking students to distinguish between: (a) implicit and explicit assumptions and (b) assumptions and assertions.

- Ask students to develop criteria for evaluating the quality of assumptions, or provide them with this list: Better assumptions are more reasonable, logical, comprehensive, plausible, likely, rational, impartial, objective, justified, credible, or believable. It would be best for students to address this task as a homework problem and then address it again in small group and/or whole class discussions.
- Ask students identify assumptions that other people might hold about an open-ended problem.
- Provide students with two readings (e.g., student papers or articles) in which the authors make different assumptions related to an open-ended problem. Have students identify the explicit and implicit assumptions made and then discuss the quality of each assumption. This activity might be performed as individual homework, small group discussion, and/or whole class discussion.
- During class discussion about an open-ended problem (or when reviewing students' papers), identify situations in which students make implicit assumptions. Ask follow-up questions such as these: What assumption are you making? Is this assumption always true? If this assumption is true, then what else must also be true? How might you justify this assumption? What arguments might be made against this assumption?

Learning Goal 3.12: Explore Different Viewpoints/Perspectives

The Biased Jumper recognizes that different viewpoints/perspectives exist, but she believes that they arise solely because of personal characteristics such as upbringing, intentional bias, or individualism. She needs to develop a deeper understanding of possible reasons behind different viewpoints, which will improve her ability to relate different viewpoints with assumptions and biases. Below are several learning activities to help build these skills.

- Have students identify as many perspectives as possible related to an open-ended problem. Perspectives can relate to any type of grouping that is meaningful to the problem, such as categories of people, cultures, societies, roles, races, genders, hierarchies, theories, concepts, ideas, beliefs, attitudes, physical locations, time, disciplines, values, and emotions. Give this task to students as a homework assignment, and then have them expand their lists through small or large group discussions.
- Have students evaluate the concerns and issues that are relevant for various people, organizations, or groups (sometimes called stakeholders) related to a problem. Ask questions such as these: How would other people, organizations, or groups respond to this problem? What influences how you respond to this problem? What would influence how others respond? How might people who disagree about this problem argue their cases?
- Have students identify assumptions and/or biases for more than one perspective related to an open-ended problem. The box below provides an example of this type of activity.

Learning Activity: Assumptions, Biases, and Perspectives

This learning activity was written by Susan Wolcott and Charlene Gray.

Responding to a Homeless Man

[Refer to the homeless man scenario presented earlier in the chapter on page 3-4.]

Homework and/or Discussion Questions:

To focus on Step 2 skills, ask students the following questions:

1. Describe each point of view (Karen and Holly)
2. List possible underlying assumptions for each point of view
3. For each point of view:
 - a. Select one underlying assumption
 - b. Explain how that assumption leads to how the person would respond to the homeless man.

Learning Goal 3.13: Compare and Contrast Theories/Perspectives

The ability to compare and contrast theories/perspectives requires practice. Give students several opportunities, and consider encouraging them to use one or more of the following web sites for further assistance:

- www.unc.edu/depts/wcweb/handouts/comparison_contrast.html
- leo.stcloudstate.edu/acadwrite/comparcontrast.html
- www.manatee.k12.fl.us/sites/elementary/palmasola/rcccon1.htm
- rwc.hunter.cuny.edu/reading-writing/on-line/comparis.html

Learning Goal 3.14: Organize Information into Meaningful Categories

The Biased Jumper typically does not have much difficulty organizing information because she thinks about information rather simplistically and ignores contradictory information. More full development of Step 2 skills enables consideration of a much wider and richer set of information and analyses, which can lead to organizational difficulties. How should all of this information be organized to make it even more meaningful?

- Discuss with students the similarities and differences between organizing information to help you think about it and organizing information for presentation to others (such as a written paper or oral presentation).
- Demonstrate and have your students practice concept mapping (or mind mapping). Here are some web sites with information about this technique:
 - www.mindtools.com/mindmaps.html
 - www.coun.uvic.ca/learn/program/hndouts/map_ho.html
 - www.jcu.edu.au/studying/services/studyskills/mindmap/index.html
 - classes.aces.uiuc.edu/ACES100/Mind/CMap.html
 - www.mindtools.com/mindmaps.html
 - ltsnpsy.york.ac.uk/conceptmapping/
 - users.edte.utwente.nl/lanzing/cm_home.htm
- Depending on the types of open-ended problems in your course, consider demonstrating and having your students practice a variety of techniques for organizing information such as Venn

diagrams, bar and line graphs, pie charts, tree diagrams, fishbone diagrams, information gathering matrices, and organizational charts. The pro/con table shown above can also be used as an organizing tool.

- Ask students to identify the larger context(s) for an open-ended problem and discuss the contextual implications for evaluating and organizing information. Here are examples of contexts (source: wsuctproject.wsu.edu/ctr.htm):
 - Cultural/Social: Group, national, ethnic behavior/attitude
 - Scientific: Conceptual, basic science, scientific method
 - Educational: Schooling, formal training
 - Economic: Trade, business concerns costs
 - Technological: Applied science, engineering
 - Ethical: Values
 - Political: Organizational or governmental
 - Personal Experience: Personal observation, informal character
- Here are additional web sites that could help your students explore organizational methods:
 - www.irmi.com/Expert/Articles/2002/Blake08.aspx
 - depts.alverno.edu/cil/mod3/orgsyn.html
 - www.captive.com/newsstand/garyblake/GetOrganized.html

Templates for Designing Developmental Questions Aimed at Step 2 Skills

The following templates might be helpful as you design assignments and conduct classroom discussions aimed at helping students build Step 2 skills. (The templates are combined for Steps 1, 2, 3, and 4 in Exhibit 3.3.)

Question Templates for Step 2 Skills

Interpreting Information From Multiple Viewpoints:

- Describe the pros and cons (or advantages/disadvantages, or strengths/weaknesses) of _____
- Analyze the costs and benefits of _____
- Explain how ambiguities affect your analysis of _____
- Identify assumptions associated with _____ (a point of view or alternative)
- Interpret _____ from the viewpoint of _____
- Appropriately use _____ (a technique) to analyze _____
- Objectively evaluate _____ information
- Explain how alternative solutions might affect _____ (one or more individuals, organizations, groups, or other stakeholders)
- Analyze the quality of information and evidence related to _____
- Identify own biases and explain how those biases were controlled when _____
- Identify the effects of _____ on _____

Organizing Information:

- Develop meaningful categories for analyzing information about _____
- Organize the various aspects of _____ to assist in decision making

Working With the Perpetual Analyzer to Foster Step 3 Skills

Review the characteristics of the Perpetual Analyzer (Performance Pattern 2; see Chapter 2 and Appendix A, p. A-3). The Perpetual Analyzer is able to present coherent descriptions of a problem, identify issues associated with multiple perspectives, and present logical and qualitative analyses of evidence. On the other hand, he often exerts significant energy trying to maintain balance, which conflicts with choosing and justifying one solution as superior to other solutions. This can cause him to jeopardize class discussions that focus on resolving problems. For example, he might argue that he can't think about the solution to a problem until everyone agrees on definitions. The biggest difficulty for the Perpetual Analyzer is an inability to establish priorities or other criteria that will help him adequately evaluate across perspectives. Thus, he should be given learning activities that require him to practice and develop Step 3 skills. Below are descriptions of learning activities that focus on those skills.

Learning Goal 3.15: Identify the Most Important Issues, Risks, or Evidence

The earlier section on Step 1 skills included learning activities to help students identify and describe uncertainties, and the preceding section on Step 2 skills introduced learning activities to help students evaluate the quality of evidence and explore perspectives. Professors often assume that when students learn Step 1 and 2 skills, they also learn how to recognize the most important issues, risks, and evidence. However, the ability to establish which information or issues are most important—without being unduly biased—requires highly complex thinking. Because the Perpetual Analyzer has the ability to fully explore information and perspectives, he can be taught to pull away from the details and consider the overall picture. Here are learning activities to help develop this skill:

- The Perpetual Analyzer will benefit from many of the same activities described above for Step 1 and 2 skills. But in addition to identification and analysis, he should be asked to reach conclusions. Which issues are most important? Which uncertainties or risks absolutely need to be addressed, and which are less critical? Which evidence is strongest? In what areas is additional evidence necessary (as opposed to desirable)?
- Demonstrate and have your students practice ranking the issues, uncertainties/risks, and evidence for open-ended problems.

Learning Goal 3.16: Justify Selection of Assumptions

The Perpetual Analyzer has difficulty settling on a set of assumptions when addressing an open-ended problem because of concerns that no set of assumptions is perfect. He can see the strengths and weaknesses, and his decision making becomes “frozen.” Learning activities such as these can help students select and justify a reasonable set of assumptions:

- Ask students to address questions such as these: Which assumptions have the biggest influence on conclusions in this problem? How important is the solution to this problem, and what does that importance imply about the importance of assumptions? What does it mean for an assumption to be *reasonable* versus *unreasonable*? What is the worst that can happen if it turns out that this assumption (or set of assumptions) is incorrect? For this problem, which criteria are most important for evaluating assumptions?
- Have students practice identifying two or more potential sets of assumptions for an open-ended problem. Then have students discuss how different sets of assumptions affect conclusions. By identifying more than one set, the Perpetual Analyzer will probably be less concerned about perfection.

Learning Goal 3.17: Prioritize and Clarify Values Used to Judge Across Alternatives

One of the biggest advantages of teaching the Perpetual Analyzer is that he thinks more like professors than like students having less complex critical thinking skills. The Perpetual Analyzers generally knows that he must make a decision, and he is eager to obtain the professor's guidance. Below are learning activities to help students reach well-justified conclusions for open-ended problems.

- Ask students to compare and contrast the terms *bias* and *priority*. The Perpetual Analyzer often believes that establishing priorities is the same as being biased. You can help him distinguish between these two aspects of critical thinking, and thus reduce his reluctance to choose one alternative over another.
- Professors should model the process of developing priorities/values/criteria/guidelines/frameworks that can be used to choose across viable alternatives. The Perpetual Analyzer “can’t see the forest for the trees.” With a little guidance, he can learn to back away from the details and consider overarching issues.
- Ask students to practice identifying two or more potential sets of values for an open-ended problem. Then have students discuss how different sets of values lead to different conclusions. Also ask students to consider circumstances under which different values might be more important than others.

Learning Goal 3.18: Establish Plan for Communication/Implementation/Action

Step 3 skills include incorporating the concerns and needs of others in plans for communication, implementation, or action. This means that students must not only satisfy themselves that their conclusions are appropriate, but they must also be prepared to persuade other people, organizations, or groups. To be persuasive, students must thoroughly analyze others' needs and likely reactions (a Step 2 skill) and consider how best to appropriately adapt plans (a Step 3 skill). The Perpetual Analyzer typically wants to demonstrate his all of his analyses and thought processes when communicating or working with others. He needs to focus on prioritizing the information he presents for a given audience. Here are some learning activities to address this skill:

- Ask students to visualize and address the needs/concerns of a particular audience when writing about an open-ended problem. This might mean adapting the content, language, or tone of a written document, or it might mean modifying action/implementation plans to reduce resistance (which might entail one or more compromises).
- Some audiences, such as business managers, require written communications to be as short as possible. Provide students with examples and discuss strategies for writing concisely, while at the same time addressing the most important issues.
- Consider dividing the written assignment into two parts. In the first part, have students provide a written communication addressing the concerns and needs of a particular audience. In the second part, have students write a memo explaining how they deciding what information they included in the first part. This type of assignment reduces the Perpetual Analyzer's tendency to include all of his analysis in the first communication. It also provides the professor with more information about students' critical thinking skills, which can be useful when assessing their performance (see Chapter 4). In particular, this assignment design can help professors determine whether a well-presented set of recommendations is supported by thorough analyses.

Note: In typical undergraduate classrooms, which are dominated by Biased Jumpers and Confused Fact-Finders, professors may not wish to devote significant classroom time to the developmental needs of Perpetual Analyzers. In such cases, professors should consider meeting with these more advanced students individually or providing them with detailed written feedback.

Templates for Designing Developmental Questions Aimed at Step 3 Skills

The following templates might be helpful as you design assignments and conduct classroom discussions aimed at helping students build Step 3 skills. (The templates are combined for Steps 1, 2, 3, and 4 in Exhibit 3.3.)

Question Templates for Step 3 Skills

Prioritizing and Concluding:

- Develop and use reasonable guidelines for drawing conclusions regarding _____
- Assess the amount of uncertainty (or degree of risk) of _____
- Objectively consider _____ when making a decision about _____
- Prioritize _____
- Consider _____ in reaching a conclusion
- Develop reasonable recommendation for _____
- Address the costs and benefits of _____ in reaching a conclusion about _____
- Develop reasonable policies for _____
- Develop an effective plan for addressing _____

Effectively Involving Others in Implementation:

- Take actions to implement the best solution to _____
- Organize _____ (a communication) so that it is meaningful to the receiving party
- Communicate _____ effectively for _____ (a given setting and audience)

Working With the Pragmatic Performer to Foster Step 4 Skills

Review the characteristics of the Pragmatic Performer (Performance Pattern 3; see Chapter 2 and Appendix A, p. A-3). In most classes, the Pragmatic Performer does not have many classmates who can operate at her level, so in-class discussions may not be as valuable for him as for other students. Providing individualized feedback and acting as a sounding board for his ideas can be particularly helpful for the Pragmatic Performer. The Pragmatic Performer should be given learning activities that require him to practice and develop Step 4 skills. Below are descriptions of learning activities that focus on those skills.

Learning Goal 3.19: Prioritize and Address Solution Limitations

The Pragmatic Performer can adequately describe limitations of his solution to an open-ended problem. However, he tends to focus on “solving” an open-ended problem all at once rather than addressing it over time. Ask students to identify ways to plan for future monitoring and improvements to the solution of an open-ended problem. Have students decide which solutions limitations are most important and focus future efforts accordingly.

Learning Goal 3.20: Systematically Reinterpret Information Over Time

Over time, some of the uncertainties related to an open-ended problem become resolved, new relevant information becomes available, and new insights arise from existing information. Ask students to anticipate these types of changes as they address an open-ended problem. Question G for Janet Baker’s Residence Decision on page 3-8 is a simplified version of this type of activity. A more complex version is the type of reinterpretation used by academic researchers when studying and drawing new conclusions from a body of research.

Learning Goal 3.21: Develop Viable Strategies for Generating New Knowledge

The best critical thinkers can articulate a process by which they not only evaluate and reach reasonable conclusions from existing information, but they also incorporate in that process viable strategies for generating new knowledge, as needed, for important open-ended problems. This skill is central to academic or other frontier/cutting-edge research. To help students begin to develop this skill, model how you think about research in your field, and have students read and discuss academic research and learn about research methods.

Learning Goal 3.22: Engage in Life-Long Learning

Life-long learning, also called continuous learning, is the active seeking of knowledge. This approach to learning is proactive; instead of waiting to receive knowledge, the learner displays curiosity and adopts a questioning approach. Life-long learning might be more an attitude than a skill. Nevertheless, students are more likely to adopt this way of thinking when they have developed other Step 4 skills. This set of skills includes recognizing that considerable amounts of knowledge are tentative and that new knowledge can be actively sought. More importantly, these skills include methods and techniques for addressing significant limitations and generating new knowledge. Professors can encourage an attitude of life-long learning by helping students develop other Step 4 skills and by engaging them in discussions about the nature of knowledge and learning.

Templates for Designing Developmental Questions Aimed at Step 4 Skills

The following templates might be helpful as you design assignments and conduct classroom discussions aimed at helping students build Step 4 skills. (The templates are combined for Steps 1, 2, 3, and 4 in Exhibit 3.3.)

Question Templates for Step 4 Skills

Acknowledging Limitations:

- Identify and describe potential future developments in _____
- Describe limitations to a recommendation about _____
- Strategically/proactively consider contingencies and future developments related to _____

Creating and Monitoring Strategies

- Develop and monitor strategies for _____
- Implement appropriate corrective action for _____ over time
- Acknowledge changing circumstances and reconsider _____ (a solution) as appropriate
- Continuously monitor and update _____, as needed
- Develop strategic uses of _____
- Manage _____ under changing or unusual demands
- Apply continuous improvement principles to _____

Working With the Strategic Re-Visioner

Review the characteristics of the Strategic Re-Visioner (Performance Pattern 4; see Chapter 2 and Appendix A, p. A-3). The Strategic Re-Visioner is even rarer in the classroom than the Pragmatic Performer. She is the student you may especially enjoy having as part of your class because she is more likely than others to ask the kind of questions you might ask. As with the Pragmatic Performer, your role with this student should include individualized feedback about her ideas. If possible, help her find ways to practice her skills in research projects and practical professional settings.

Summary of Assignment Templates

Exhibit 3.3 summarizes the recommendations made above for working with students to develop skills at each level in Steps for Better Thinking. Below we provide more details of techniques you can use to design coursework for your students.

Addressing Diverse Performance Patterns in a Classroom

The preceding discussions presented ideas for teaching critical thinking skills for each critical thinking performance pattern, one at a time. Classrooms are usually populated by students exhibiting a range of performance patterns.³ How can you address the developmental needs for a diverse group of students? Several strategies are discussed below.

Coordinate Critical Thinking Skill Development Across the Curriculum

An efficient approach for addressing students' developmental needs is to coordinate critical thinking across the curriculum. Professors could focus on less complex skills early in the curriculum, and then increase complexity as students advance through a program. For a typical undergraduate program, introductory courses could focus primarily on Step 1 skills. Intermediate-level courses could then concentrate more heavily on Step 2 skills, and students in advanced courses might be ready to address Step 3 skills. Keep in mind that students are unlikely to develop skills if they are given tasks more than one level higher than their current performance. If a significant proportion of students operate as Confused Fact-Finders in an intermediate-level course, then they need to focus primarily on Step 1 skills; asking those students to address Step 2 tasks will probably frustrate both the students and the professor. In addition, programs need to allow sufficient opportunities to practice new skills. It might take as long as two years for students to develop strong Step 2 skills. For sequential development across a program to be successful, the earlier courses must set the stage for development in the later courses. Assessments could be used in key courses across the curriculum to monitor student progress and provide professors with information for evaluating the reasonableness of targeted skills.

Focus on the Ideal Critical Thinking Level for a Course

In most college programs, the development of critical thinking skills is not explicitly coordinated. Individual professors make decisions about which, if any, critical thinking skills to address in their courses. One approach in this setting is for the professor to decide upon the level of critical thinking skills that students in a particular course *should* be capable of addressing. Professors who adopt this approach often want to ensure high standards for their course, which means that the targeted critical thinking level is likely to be set at a high level. Accordingly, a significant proportion of students may be incapable of strong performance. This approach might be particularly useful for “weeding out” students

³ To identify the performance patterns in your classroom, you could use assessments as illustrated in Chapter 4. Alternatively, you could rely on the average levels of performance at different age levels based on reflective judgment research, as discussed in Chapter 4.

Exhibit 3.3

Templates for Designing Assignment Questions

←Less Complex Skills		More Complex Skills→	
Step 1—Identifying	Step 2—Exploring	Step 3—Prioritizing	Step 4—Re-Visioning
<p>Identifying Relevant Information:</p> <ul style="list-style-type: none"> * List data or types of information relevant to _____ * Identify relevant information in _____ (a textual passage such as a case, article, or piece of literature) * Identify or access relevant theories, laws, standards, or rules for _____ * Identify factors or issues related to _____ * Identify various potential points of view or solutions to _____ * Describe arguments in favor of _____ <p>Identifying Uncertainties:</p> <ul style="list-style-type: none"> * Describe uncertainties concerning _____ * Identify and describe uncertainties about the interpretation or significance of _____ * Identify risks associated with _____ * Describe why there is no single, “correct” way to _____ * Identify reasons why _____ might change or vary 	<p>Interpreting Information From Multiple Viewpoints:</p> <ul style="list-style-type: none"> * Describe the pros and cons (or advantages/disadvantages, or strengths/weaknesses) of _____ * Analyze the costs and benefits of _____ * Explain how ambiguities affect your analysis of _____ * Identify assumptions associated with _____ (a viewpoint or alternative) * Interpret _____ from the viewpoint of _____ * Appropriately use _____ (a technique) to analyze _____ * Objectively evaluate _____ information * Explain how alternative solutions might affect _____ (one or more individuals, organizations, groups, or other stakeholders) * Analyze the quality of information and evidence related to _____ * Identify own biases and explain how those biases were controlled when _____ * Identify the effects of _____ on _____ <p>Organizing Information:</p> <ul style="list-style-type: none"> * Develop meaningful categories for analyzing information about _____ * Organize the various aspects of _____ to assist in decision making 	<p>Prioritizing and Concluding:</p> <ul style="list-style-type: none"> * Develop and use reasonable guidelines for drawing conclusions regarding _____ * Assess the amount of uncertainty (or degree of risk) of _____ * Objectively consider _____ when making a decision about _____ * Prioritize _____ * Consider _____ in reaching a conclusion * Develop reasonable recommendation for _____ * Address the costs and benefits of _____ in reaching a conclusion about _____ * Develop reasonable policies for _____ * Develop an effective plan for addressing _____ <p>Effectively Involving Others in Implementation:</p> <ul style="list-style-type: none"> * Take actions to implement the best solution to _____ * Organize _____ (a communication) so that it is meaningful to the receiving party * Communicate _____ effectively for _____ (a given setting and audience) 	<p>Acknowledging Limitations:</p> <ul style="list-style-type: none"> * Identify and describe potential future developments in _____ * Describe limitations to a recommendation about _____ * Strategically/proactively consider contingencies and future developments related to _____ <p>Creating and Monitoring Strategies</p> <ul style="list-style-type: none"> * Develop and monitor strategies for _____ * Implement appropriate corrective action for _____ over time * Acknowledge changing circumstances and reconsider _____ (a solution) as appropriate * Continuously monitor and update _____, as needed * Develop strategic uses of _____ * Manage _____ under changing or unusual demands * Apply continuous improvement principles to _____

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(This exhibit can be downloaded under “Educator Resources” at www.WolcottLynch.com.)

with weaker skills and ensuring that students who successfully complete the course have achieved a given standard. It also allows the professor to concentrate on the developmental needs of students having stronger skills. On the other hand, the professor might need to consider whether this approach is ethical. What are the professor's responsibilities to students who are admitted to the course having weaker skills? Do the college, program, and/or individual professor have obligations to meet these students at their own developmental level? Of course, these questions could also be asked about obligations to students having stronger skills.

Focus on the Average Critical Thinking Level in a Course

Another approach for the individual professor is to focus upon critical thinking skills for the "average" student in a course. The professor could use assessments to determine the typical distribution of performance patterns and then focus on the middle of the distribution. Particularly if the distribution of performance patterns in a course is fairly narrow, this approach might address the developmental needs of most students. However, the needs of students in the tails of the distribution might be ignored.

Focus Simultaneously on a Range of Critical Thinking Levels in a Course

Still another approach is for the professor to simultaneously address a range of critical thinking skills in an individual course. Students can be given assignments such as Janet Baker's Residence Decision problem on pages 3-7 and 3-8, which address multiple critical thinking skill levels. Additional examples are provided in Appendix H. Exhibit 3.4 explains how to construct and use this type of assignment. Simultaneously addressing multiple skill levels provides two major benefits. First, providing students with a list of increasingly complex questions gives students guidance to help them perform at the upper end of their capabilities.⁴ Second, assignments that address the full range of skills in Steps for Better Thinking typically provide better assessment information about students' performance patterns (discussed further in Chapter 4). The major drawback of designing this type of assignment is the student/classroom time and grading effort that must be devoted to such assignments. Professors do not always wish to give students long assignments or hold lengthy discussions on a single problem. To address this concern, professors can provide students with this type of multi-step problem only periodically during a course. Other assignments can focus more narrowly on one or two skill levels. For example, a series of short assignments on uncertainties would be appropriate if many students in the course lack Step 1 skills. A series of short assignments focusing on one or more Step 2 skills might be appropriate if most students already exhibit Step 1 skills.

Explicitly Using Steps for Better Thinking With Students

As shown in this chapter, professors can use Steps for Better Thinking to guide the development of critical thinking skills in their courses. Professors can use the model for course design whether or not they explicitly introduce it to students. However, I have found that students often respond well to the explicit introduction of this model, particularly in courses where critical thinking skills are addressed heavily. Students appreciate receiving explicit guidance about critical thinking expectations, which can be communicated through the model and also through use of a grading/assessment rubric (see Chapter 4). A rubric can also be used for student self-evaluations or for peer evaluations.

Grading Critical Thinking Performance

Questions exist about the effect of grades on student motivation and performance. Many professors believe that critical thinking performance must be graded to motivate greater student effort. However, it

⁴ Many professors are concerned about providing too much structure, which they believe may prevent students from exhibiting skills on their own. For a discussion of this issue, see the later section in this chapter, "When Should We Remove the Scaffolding?"

is possible that grades might inhibit performance. Students want to perform well on a critical thinking assignment; they want to demonstrate this capability. However, recall that the development of critical thinking skills includes adopting new ways of looking at the world. The pressure of grades might prevent at least some students from taking necessary risks; they might adopt a more conservative stance, which means using the skills with which they are comfortable.⁵ In addition, questions arise about the fairness of grading critical thinking skills when professors know that student performance depends on the skills they have when they enter a course.⁶

For development of critical thinking skills, it might be sufficient to grade students' *attempts* to fully address tasks that require critical thinking. However, professors need to keep in mind that a Confused Fact-Finder's best attempt may be quite poor! Sometimes it is not possible to distinguish between a paper that was given little effort and a paper written by a student having poor skills.

If you decide to grade student critical thinking performance, consider the following ideas:

- You might be able to reduce negative student emotional reactions by avoiding the term “critical thinking.” Consider using the term “open-ended problem” when referring to a critical thinking assignment, and the term “judgment” rather than “critical thinking.”
- Tell students that the first major open-ended assignment (preferably very early in the course) will be graded only based on (1) their writing quality (such as spelling, grammar, and general organization) and (2) their attempt to fully address the assignment.⁷ Also tell students that the first assignment provides an opportunity for them to obtain feedback before they submit later assignments, which will be graded. Students are not likely to “blow off” the assignment, and they will probably be very interested in the class discussion—particularly if the assignment topic is interesting. Students appreciate the opportunity to receive written feedback on their work before being graded on it, particularly if the feedback includes a rubric that will be used again on later assignments.
- Consider setting the level of an “A” at a level that will challenge most students in the course (for example, it might be one level higher than the average performance pattern among students in the course). If you are using a rubric for student feedback, tell students which level they must achieve to earn an A on critical thinking tasks.
- Include open-ended questions on exams. These questions might be short, focusing on only aspect of a problem. Students often pay close attention to exam content, and a failure to include any open-ended questions on an exam can signal to students that critical thinking is not important.

Supporting Better Student Performance

Keep in mind that you are asking students to give up their old, comfortable ways of thinking and to adopt new beliefs about the world. (See Chapter 2 for discussions of beliefs that can hinder performance for Performance Patterns 0, 1, 2, and 3.) Kurfiss (1988, p. 51) pointed out that “discrepancies between students' and professors' assumptions about knowledge probably account for the major share of the

⁵ Thanks to Dave Porter of Berea College for introducing me to these ideas.

⁶ Of course, the same is true for other aspects of a course that are graded. These are interesting questions for educators to pursue further.

⁷ Keep in mind that the quality of student writing and the completeness of their response are functions of their critical thinking skills.

Exhibit 3.4

Designing and Using Assignments Addressing Multiple Skill Levels

Use the following procedures to create and use an assignment that addresses a range of critical thinking skill levels.

1. Identify or create a scenario involving an open-ended problem—one for which there is no single correct answer. Students are likely to be more motivated and provide the strongest performance if the problem is interesting. The best problems focus on a real or realistic situation.
2. Generate a list of potential questions aimed at different skill levels. Use the templates in Exhibit 3.3, the assignment examples shown in Appendices B through H, and the discussions for each skill level from earlier in this chapter for ideas. Professors often have the most difficulty writing questions aimed at Step 1; they often incorporate too much complexity in those questions.
3. Select a subset of questions that addresses the range of skills you consider particularly important for your class, as follows:
 - a. Ask at least one question aimed at the lowest expected level of performance for students in the class. For most courses, this means including at least one Step 1 question. However, it might be appropriate to begin at a higher skill level in some courses (for example, in a graduate course where a prior assessment indicates that all students perform at a higher level).
 - b. Aim the majority of questions at:
 - i. The current ability of the average student in the class, plus
 - ii. The targeted level of performance for the class—typically one level higher than the current ability of the average student.
 - c. To challenge students who have higher than average ability and to convey to all students that there are important high-level skills that they will eventually need to develop, ask one or more questions that are above the targeted level for the class.
4. When conducting a classroom discussion of the problem, begin with the well-defined course material, and then more sequentially from less complex questions to the most complex questions. This sequence allows students having weaker skills to participate in the discussion as long as possible. Once the discussion exceeds their skills by more than one level, students are not likely to understand the issues and arguments raised. Do not be concerned if insufficient class time exists to address the most complex questions; you can provide students with feedback on written papers for those questions.
5. Consider student abilities when deciding whether or how to call on students during a class discussion. Students having weak skills will be confused and unable to respond adequately to high-level questions. Here are two approaches for addressing this concern:
 - a. Have students discuss a question in small groups, and then call on representatives to share their group's response with the whole class. For this approach to be most successful, group members should have diverse skills.
 - b. Use an assessment early in the course to determine the skill levels of individual students, and use that information to call on students who are likely to be able to address each question (questions should have a complexity no higher than one level beyond the student's current performance pattern).

frustration both groups experience when critical thinking is required in a course." When you encourage students to develop more complex thinking skills, you are challenging their beliefs about how the world works. These shifts in their awareness can create some discomfort and sometimes generate resistance. Most students need: (1) guidance to see alternatives to their current methods and (2) support to take the necessary risks. In addition to monitoring the structure of assignments given to students, you can do a wide range of things to support your students' efforts. Below we discuss how you can support your students.

Balance Challenge with Support

Without adequate challenge, students are unlikely to develop higher complexity competencies. However, if students are asked to perform tasks that are too far beyond their current capacities, they can become overwhelmed. To balance challenge with support, professors can adopt one or more of the following strategies:

- Designing assignments that ask students to address specific questions (as illustrated earlier in this chapter)
- Sharing with students examples of appropriate responses to similar assignments
- Holding class discussions about similar assignments and modeling appropriate approaches
- Sharing Steps for Better Thinking with students and helping them approach open-ended problems as a process
- Legitimizing students' discomfort by letting them know that the thinking process is complex and messy and that experts (including the professor) struggle
- Teaching students to self-evaluate their performance using a rubric

When Should the Scaffolding Be Removed?

Many professors are concerned that structuring assignments and providing support, as recommended in this chapter, can prevent students from learning how to exhibit critical thinking skills on their own. Professors want students to perform well at the time of graduation. Given this goal, what level of structure is appropriate? If professors provide structure, when is the best time to remove it?

I hypothesize that most professors either fail to provide sufficient structure to begin with, or they remove structure too quickly. Students need a substantial amount of practice and scaffolding to learn the types of complex skills addressed in this handbook. They begin their learning process by mimicking the skills their professor models for them. However, students typically cannot exhibit skills on their own, even after successful mimicking, without substantial practice over time. For example, students might learn to perform adequately in a given course with assignments structured to support higher levels of performance, but perform inadequately when the structure is removed or when they move to the next course in their degree program. With sufficient practice the skills can become embedded in the way students respond to open-ended problems, and they become more able to generalize the skills to different contexts (Fischer & Pruyne, 2002; and Fischer & Bidell, 1998, 478). Thus, many professors should probably spend greater effort designing appropriate scaffolding and delay the removal of structure.

Overwhelmed?

This chapter introduced numerous ideas for helping students develop critical thinking skills, and the teaching task might seem overwhelming. In the box below are ideas for getting started.

To-Do List for Getting Started

Pick one critical thinking aspect of your class in which students typically have difficulty, and:

- Quickly gain useful information about students' critical thinking skills by using the "One-Paragraph Assignment: Identify and Describe Uncertainties" shown on pages 3-3 and 3-4 of this chapter.
- Use Steps for Better Thinking to help you analyze what your students must know and do to perform well.
- Modify an existing assignment or create a new assignment to give students structure for better performance (see Exhibit 3.4).
- Work toward giving students improved feedback.
- Avoid penalizing students for poor performance on skills above reasonable targets for the course.

Chapter 3 References

Eldenburg, L. G. and S. K. Wolcott. (2005). *Cost Management: Measuring, Monitoring, and Motivating Performance*. New York: John Wiley & Sons.

Fischer, K. W., and Bidell, T. R. (1998). Dynamic development of psychological structures in action and thought. In R. M. Lerner (Ed.) and W. Damon (Series Ed.), *Handbook of child psychology. Vol. 1: Theoretical models of human development* (5th ed., pp. 467-561). New York: Wiley.

Fischer, K. W., & Pruyne, E. (2002). Reflective thinking in adulthood: Development, variation, and consolidation. In J. Demick & C. Andreoletti (Eds.), *Handbook of Adult Development* (pp. 169-197). New York: Plenum.

Kurfiss, J. G. (1988). *Critical thinking: Theory, research, practice and possibilities* (ASHE-ERIC Higher Education Report No. 2). Washington, DC: Association for the Study of Higher Education.

Suggested Professor Activities

The following activities are designed to help you reflect upon and implement the ideas presented in this chapter. You may wish to engage in these activities individually or with colleagues.

1. Review the end-of-chapter material contained in one chapter of a textbook you use. See if you can find examples of questions that explicitly address each level in Steps for Better Thinking. What seems to be the emphasis of questions in the textbook? Given this emphasis, what types of skills are students likely to develop? (Remember, if steps are "skipped," it is unlikely that the more complex skills will develop.)
2. Identify a textbook problem that addresses only foundation/content knowledge from a course you teach. Identify ways you could expand the problem to help students develop more complex skills.
3. Identify an open-ended assignment from a course you teach. Using the techniques described in this chapter:

- Using Exhibit 3.4 as a guide, modify the assignment to ask questions that address multiple skill levels.
 - Make a list of support strategies you could use to promote better performance by your students.
4. Discuss with colleagues how you might coordinate your educational efforts to provide better long-term support for student development across the curriculum.

Chapter 4

Assessing Students' Critical Thinking Skills

This chapter:

- Explains why assessment is crucial to educational design;
- Introduces a framework for evaluating the quality of a planned assessment;
- Describes a process for assessing student responses to an open-ended problem;
- Introduces and offers suggestions for using four assessment rubrics; and
- Presents research data about performance patterns.

Why Is Assessment Crucial to Student Learning?

Educators constant seek ways to improve what they do. The fact that you are reading this handbook suggests that you are interested in learning more about how your students can gain critical thinking skills. Nevertheless, educators often view assessment with skepticism. Assessment is sometimes seen as a waste of faculty and student time, and it is often deemed a necessary evil arising from governmental or accreditation mandates. Given such negative attitudes, assessment may be given insufficient consideration in teaching efforts. This is unfortunate, because assessment is necessary for designing more powerful learning environments. Palomba and Banta (1999, p. 1) captured a more positive view of assessment when they described it as “a process that focuses on student learning, a process that involves reviewing and reflecting on practice as academics have always done, but in a more planned and careful way.”

Assessment is necessary for designing more powerful learning environments.

Exhibits 1.5 and 1.6, introduced in Chapter 1, provide a useful framework for understanding the importance of assessment for student learning. As described in Chapters 2, students' cognitive skills develop sequentially from less complex to more complex. If educational efforts are aimed at skills that are either too simplistic or too complex, students are unlikely to develop desired critical thinking skills. Professors can use assessment techniques to identify students' current skill levels, determine whether desired student outcomes are reasonable, and then design more powerful educational environments.

Assessment Triangle

The assessment triangle shown in Exhibit 4.1 provides a theoretical framework for the assessment methods introduced in this chapter. A variety of methods may be used to assess critical thinking skills. For an overview of alternative methods, see Wolcott (2005). No assessment method for critical thinking is perfect, but more valid and reliable assessments can be achieved through careful design and interpretation. Below are questions to consider when choosing an assessment method, along with some of the key choices made for the material presented in this chapter.

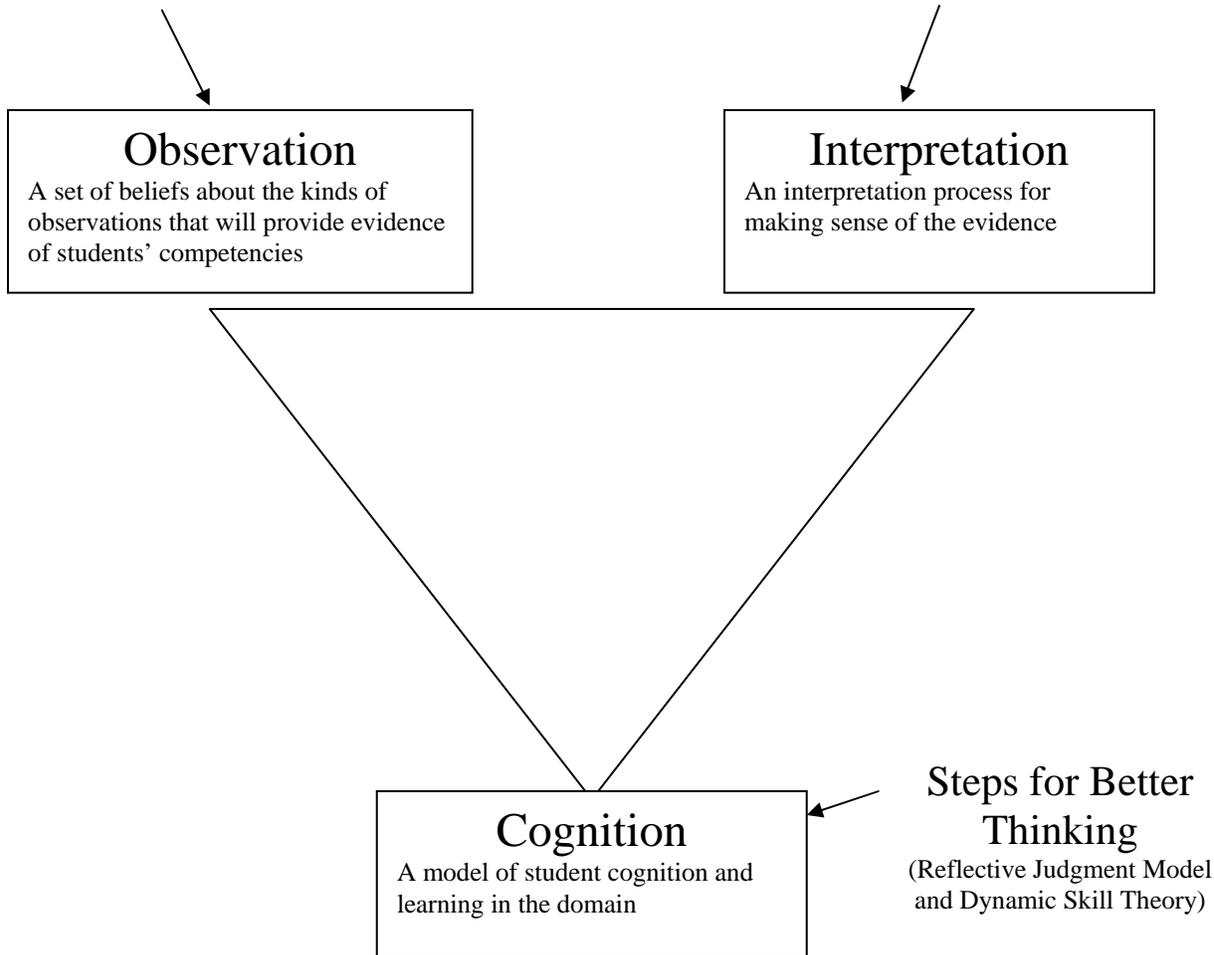
Exhibit 4.1 Assessment Triangle

Essay or Other Student Response
to an Open-Ended Problem

(Elicit details of the
complexity of student thinking)

One or More Rubrics

(Discussed in this chapter)



Adapted from Pellegrino, et al. (2001, pp. 39-45; 281).

Model of Cognition: Steps for Better Thinking

The assessment triangle is based on a model of cognition, which helps in measuring student performance and also suggests ways to improve teaching and learning. Here are some questions to consider when choosing a model of cognition (adapted from Pellegrino et al., 2001 and Gainen & Locatelli, 1995):

- To what degree is the model based on rigorous empirical studies of learners who have characteristics similar to your students (e.g., age, culture, gender)?
- To what degree does the model describe progression of students' development over time and allow differentiation between beginning and expert learners?
- To what degree does the model facilitate linking of assessment findings to recommendations for improved teaching and learning ("closing the assessment loop")?
- Is the model sufficiently flexible to meet classroom needs?
- To what degree does the model allow principled aggregation for different assessment purposes?

This handbook relies on Steps for Better Thinking as a model of cognition. The skills in Steps for Better Thinking emerge in a developmental, self-scaffolding sequence (see the theoretical underpinnings and performance pattern descriptions in Chapter 2). Thus, professors can use assessments of students' performance patterns to identify the next steps in their critical thinking skill development. In addition, assessment of the performance patterns can be used to measure changes in students' complexity of thinking over time. The model is also sufficiently flexible to be used by individual professors in their classrooms or by others for program assessment.

Assessments of student performance are not as tidy as suggested in Chapter 2. Individuals do not operate "at" a single level of performance (see Fischer & Pruyne, 2002). Instead, individuals operate within a developmental range. Actual performance levels depend on the assessment setting and the amount of support provided for high performance. In addition, students often exhibit characteristics of more than one performance pattern as they progress from one performance pattern to another.

Observation: Student Responses to an Open-Ended Problem

The next corner of the assessment triangle focuses on the types of assessment observations that will provide reasonable data. Some assessment methods provide better evidence about critical thinking than other methods. Here are some questions to consider when choosing an observational form (adapted from Pellegrino et al., 2001 and Gainen & Locatelli, 1995):

- How well will the assessment capture the desired learning outcome(s), especially those involving complex knowledge and skills?
- What type of student behavior will be used to determine the degree to which outcomes have been attained (including students' strengths and weaknesses)?
- Will the planned methodology result in a representative sample of student performance?
- How optimal are the assessment conditions (e.g., respondents motivated, clear and understandable format and instructions, physical environment--distractions, time, etc.)?
- If desired, can comparisons be made (e.g., same students over time or different groups of students at the same point in the curriculum)?
- Will the data collected allow conclusions to be drawn with reasonable certainty?

This chapter discusses the use of student responses to an open-ended problem for assessment. As discussed later in this chapter, the quality of the assignment task influences the quality of the assessment. In addition, the context within which an assessment is given is likely to influence student performance.

Although greater control over these factors improves the assessment validity and reliability, it is not always necessary to achieve the most valid and reliable results for classroom instructional purposes.

Interpretation: One or More Rubrics

The final corner of the assessment triangle focuses on the process for interpreting the assessment evidence. Here are some questions to consider (adapted from Pellegrino et al., 2001 and Gainen & Locatelli, 1995):

- What method(s) will be used to evaluate results? To what degree is the method tied to the model of cognition?
- Are the data rich enough to insure appropriate interpretation?
- How do the following affect interpretation of assessment results?
 - Context within which the assessment is conducted (see observation)
 - Validity of the assessment method (tied directly to model of cognition?)
 - Reliability of the rating/scoring process
 - To what degree are assessment conclusions supported through triangulation with other data?

Theoretically, high validity and high reliability go hand in hand, but this is not always the case. For example, data from an objective examination that is machine-scored might be considered very reliable, but it might not have high validity for assessment of complex thinking skills. On the other hand, an assessment is not very valid if it is extremely unreliable, so both aspects should be considered simultaneously, and trade-offs may be needed.

Validity of Steps for Better Thinking is grounded in the model's connection to longitudinal and cross-sectional observations of human performance (see Chapter 2). However, the validity and reliability of assessments using this model also depend on the assignment design and on the quality of methods used to rate student performances.

This chapter introduces four different assessment *rubrics*, or sets of scoring guidelines for assessing performance. The rubrics are adapted from the performance patterns described in the reflective judgment model (King & Kitchener, 1994), so they are less subjective than many other available critical thinking rubrics. The underlying theoretical and empirical support improves the reliability of assessments. Reliability also depends on the quality of the assessment task given to students, the context of the assessment, and the ability of raters to accurately recognize performance patterns. With high quality design and properly trained raters, it is possible to achieve high degrees of *interrater reliability* using the rubrics introduced in this chapter. However, some faculty members seem to have greater difficulty using these rubrics than others.

Other Assessment Considerations

In addition to the theoretical issues discussed above, other factors might influence the choice of assessment methods. Here are some additional questions to consider (adapted from Pellegrino et al., 2001 and Gainen & Locatelli, 1995):

- Does the method conform to legal and ethical standards for conduct of research on human subjects, if applicable?
- Does the method provide benefit for all participants, especially students and faculty most directly involved (e.g., performance feedback to students)?
- How feasible is the method, given existing time and other resources?

- Is the method needed to meet governmental, institution, or other requirements (e.g., that one or more assessment methods be nationally-normed)?

Process for Assessing Student Responses to an Open-Ended Problem

Exhibit 4.2 summarizes the steps in an assessment process. Below are recommendations and discussions of some of the issues to be considered at each step.

1. Decide on the Skill(s) to Be Assessed

Most of the assessment methods discussed in this chapter assume that the goal is to determine the students' performance patterns within Steps for Better Thinking (as described in Chapter 2). Assessing the full range of skills is desirable when you want to measure the distribution of students' skills for reasons such as these:

- Identify student critical thinking levels for the purpose of designing more appropriate learning activities in a course (per Chapter 3)
- Measure the distribution of student critical thinking levels at a point in the curriculum for program planning purposes
- Establish the distribution of student critical thinking levels at one point in the curriculum for comparison with the distribution at another point in the curriculum
- Develop data for reporting to others (e.g., as part of a formal program or college-wide assessment plan)

Although not addressed fully in this chapter, assessment plans do not necessarily need to be aimed at the entire range of skills in Steps for Better Thinking. Sometimes professors in a course want to conduct a quick assessment to get a general idea about students' critical thinking skills. An example is the "One-Paragraph Assignment: Identify and Describe Uncertainties" shown on pages 3-3 and 3-4. Other times, professors may want data about only a particular skill.

2. Establish the Desirable Degree of Validity and Reliability

In general, greater time and effort are needed to achieve higher validity and reliability. Assessment data that will be used for course planning purposes probably do not need to be as valid or reliable as data that will be used for reporting to others. Choose the degree of validity and reliability you need, after taking into account resources and time available for the assessment.

3. Design or Adopt an Appropriate Open-Ended Problem

An appropriate assignment for assessing critical thinking skills must be open-ended—i.e., have no single correct solution. Assignments could take a variety of forms, including:

- Essays
- Case write-ups
- Projects
- Constructed response (i.e., essay) exam questions
- Oral presentations (particularly if recorded)
- Entries in student journals
- Student portfolios

Exhibit 4.2

Process for Assessing Student Responses to an Open-Ended Problem

1. Decide on the Skill(s) to Be Assessed
2. Establish the Desirable Degree of Validity and Reliability
3. Design or Adopt an Appropriate Open-Ended Problem
4. Plan the Assessment Context
5. Choose Assessment Rubric(s)
6. Collect Student Responses
7. Perform Assessments
8. Provide Students With Feedback
9. Summarize, Interpret, and Report Assessment Findings
10. Use Assessment Findings for Improved Teaching and Learning
11. Consider Ways to Improve Future Assessments

Here are suggestions for designing an appropriate assignment:

- It might be easiest to begin conducting assessments using relatively short (1-2 page) student papers, similar to the examples shown in this handbook. However, short papers are fairly brief “snapshots” of students’ thinking. Students have more opportunities to demonstrate complex thinking in a longer paper.
- The assignment should encourage students to demonstrate the range of skills in Steps for Better Thinking. Use the guidance for “Designing and Using Assignments Addressing Multiple Skill Levels” in Exhibit 3.4 (p. 3-25) for writing appropriate questions. Also see the assignment design for “Janet Baker’s Residence Decision” (p. 3-7 and 3-8). This assignment asks questions to encourage students to think fully about the problem, but only the last question requires an explicit written response. This design reduces the length of paper (and therefore the assessment time), but might also reduce the quality of information for assessment. Sometimes a fairly simply assignment can provide sufficient assessment information. See, for example, the “Reliability of Internet Information” assignment (p. 2-17). The “One-Paragraph Assignment: Identify and Describe Uncertainties” (p. 3-3 and 3-4) would be particularly useful for learning about students’ Step 1 skills, but it would not generally provide sufficient information for assessing the full range of performance patterns. Additional assignment examples are provided in Appendices B through H.
- Use an interesting problem to encourage student motivation for higher performance.

It may take some practice and experimentation to design assignments that elicit good assessment information. Keep in mind that the assessment goal is to distinguish among the performance patterns described in Chapter 2. A quick way to improve assessments is to include explicit questions about uncertainties (Step 1) and multiple perspectives or pros and cons (Step 2).

4. Plan the Assessment Context

The setting and context of an assignment can have a significant effect on student performance. For example, students are likely to exhibit better performance when they are addressing an interesting problem or when they have been given explicit guidance for high performance. The interpretation of assessment results, particularly as part of an assessment plan for reporting to others, requires careful documentation and consideration of the context. The Assessment Context Form for Student Performances in Appendix I can be used for this purpose.

5. Choose Assessment Rubric(s)

This chapter introduces and illustrates the use of four different rubrics for assessment of critical thinking skills. These rubrics help professors:

- Quickly gain insights about students’ critical thinking strengths and weaknesses.
- Identify the “next steps” in building critical thinking skills.
- Can be used to provide students with feedback.
- Perform assessments efficiently by simultaneously assessing a wide range of critical thinking skills.

See Exhibit 4.8 for a comparison of the four rubrics. Specific guidance for individual rubrics is provided in Exhibits 4.4 to 4.7.

6. *Collect Student Responses*

This step simply involves giving students the assignment and collecting their responses. Any oral presentations should be recorded.

7. *Perform Assessments*

You may be uncomfortable as you begin using a rubric to assess students' performance patterns. Expect to gain greater comfort as you repeatedly use a rubric and as you modify your assignments to gather better assessment information. Here are suggestions for this step in the process:

- Practice performing assessments using the student examples in Appendices B through G.
- Begin assessing a group of papers by quickly reviewing them and sorting them into three rough “stacks”—below average, average, and above average for the class. Assess the above average stack first, the average stack second, and the below average stack last.
- It is rare for a student's performance to fit neatly into a single performance pattern. Student performances often span two adjacent patterns. This occurs in part because students often apply their skills unevenly and in part because many students are progressing at any given point in time from one performance pattern to another. On the other hand, because the rubrics in this chapter are developmentally grounded it is very rare for a given student's performance to span more than two adjacent patterns.
- Consider whether the ratings should be conducted by more than one person. For classroom purposes, it is usually sufficient for only the professor to rate student responses. For program or college purposes, the rating reliability can be evaluated by having at least a sample of responses rated independently by more than one person.
- To improve the reliability of your ratings, consider attending an intensive 2-day rating workshop (for information, contact Susan Wolcott: swolcott@WolcottLynch.com). Alternatively, work with a colleague:
 - Share five student responses and compare your assessments.
 - Discuss and reach a consensus in cases where your overall assessments differ substantially.
 - Discuss how the assignment could be modified to gather better information about student skills.

8. *Provide Students With Feedback*

For course assignments, students should receive typical feedback such as the professor's comments. See Chapter 3 for a discussion about whether critical thinking should be graded (pages 3-23 and 3-24). Consider providing students with a rubric as part of the feedback. Also consider providing students with overall comments about performance in the class and what students should do to improve their skills, either orally or in a memo as illustrated in Exhibit 4.3. Keep in mind that students generally cannot understand skills more than one level higher than their current performance, so focus their attention on the set of skills they need to address next.

If the assessment is not performed as part of a course, consider the type of feedback that might be appropriate. If possible, help students learn from their participation by providing them with feedback similar to that described in the preceding paragraph.

Exhibit 4.3

Assessment Feedback: Excerpts from a Memo to Students

Below are excerpts from a memo written by Susan Wolcott. The memo was given to students as part of the feedback for an assessment given at the beginning of a junior-level accounting course. Each student also received a completed assessment rubric and written comments on the paper. Notice that the memo refers to the performance pattern numbers rather than the labels (e.g., “Confused Fact-Finder”) introduced in Chapter 2.

I was very pleased with your overall performance! In particular, your writing was generally very strong. Most of you also took care to respond fully to the assignment.

I rated a very small number of students at “Performance Pattern 0.” If I rated your performance at this level, you didn’t demonstrate to me that you understood this problem was open-ended. Accordingly, your biggest weakness was a failure to comprehend the validity of alternative cost classifications. I suggest you concentrate on identifying uncertainties, which will help you recognize open-ended problems. Also try to avoid assuming that there must be a single “right” answer.

I rated the performance of most students at “Performance Pattern 1.” This is typical of performance in junior-level courses. The biggest weaknesses at this performance pattern are failures to more fully: (1) identify uncertainties and (2) objectively explore alternatives. If I rated your performance at this level, then I suggest you concentrate on improving these aspects of your analyses. You should pay particular attention to the sections below on uncertainties and assumptions. Try to explore problems more fully and avoid jumping too quickly to conclusions.

I rated a few students at “Performance Pattern 3.” This is very good performance for an undergraduate course! If I rated your performance at this level, you demonstrated an ability to describe uncertainties, objectively analyze pros and cons, and reach a practical solution. One of the biggest differences between Performance Pattern 1 and Performance Pattern 3 is bias—jumping to conclusions. If I made a comment that I had trouble rating your performance between these two performance patterns, this means that you did not fully explain the uncertainties, pros, and cons. It appeared that your conclusions and analyses might have been biased. However, I saw evidence of more sophisticated analysis in your paper. Expand your discussions next time to more clearly describe your thinking! People operating at Performance Pattern 3 are more skilled at analyzing information and perspectives. This helps them be more objective in their analyses and use more objective criteria in reaching a conclusion. Their biggest weakness is a failure to address more long-term, strategic issues. Work on expanding your thinking beyond the current problem.

I rated one student’s performance at “Performance Pattern 4.” This is very impressive performance. Keep up the good work!

[The rest of the memo contained comments about various aspects of the assignment.]

9. Summarize, Interpret, and Report Assessment Findings

Summarize the assessment findings and determine the distribution of performance patterns. Calculate interrater reliability (if applicable) using the “Form for Summarizing Assessments from Two Raters” provided in Appendix J. Consider the validity and reliability of the assessment in deciding how much confidence to place on the results. Then consider the following types of questions:

- How does the distribution of performance patterns and average compare with expectations? Consider the average results shown later in this chapter and/or prior assessments in the course or college.
- What implications do the assessment findings have for the course, program, or curriculum?
- If the findings will be reported to others, what information is most important and how should it be presented?

10. Use Assessment Findings for Improved Teaching and Learning

Identify potential improvements to teaching and learning by considering the following questions:

- What is the distribution of performance patterns? Given this distribution, what does the information in Chapter 2 suggest about the students’ learning needs?
- Think about the implications of the educational model in Exhibits 1.5 and 1.6. In particular:
 - In light of what you now know about students’ cognitive characteristics, how reasonable are the desired student outcomes?
 - What material in Chapter 3 might be used to improve the students’ educational environment to better address their skill levels?

Try not to make too many changes in your teaching all at once. If you alter too many aspects of your course, you will have greater difficulty determining the impact of each change. Select and implement one or two ideas at a time for improving the student learning. Plan to use assessments to gather more information and to monitor the success of your innovations.

11. Consider Ways to Improve Future Assessments

As you assess student work, you are likely to discover that your original assignment does not elicit adequate information about some aspects of your students’ skills, especially the uncertainties aspect of Step 1 and the consideration of multiple perspectives part of Step 2. Based on what you learned in this assessment experience, replace or refine the assignment to gather better assessment information in the future.

Four Rubrics for Assessing Student Performance Patterns

A *rubric* is an established guideline for classifying something into categories. Below are detailed instructions for four rubrics that may be used to assess critical thinking skills based on the performance patterns introduced in Chapter 2—specifically, Performance Patterns 0, 1, 2, 3, and 4.

Rubric #1: Steps for Better Thinking Performance Patterns

Chapter 2 introduced the different performance patterns that students might exhibit. You can use the descriptions of those patterns summarized, in Steps for Better Thinking Performance Patterns (Exhibit 2.6 and Appendix A, p. A-3), to assess student performance. The performance pattern descriptions can be

used as a holistic rubric, in which performance is evaluated based on the overall approach used by each student.

As discussed in Chapter 2, this rubric is theoretically and empirically grounded in developmental models. However, this rubric tends to be less reliable than the other rubrics presented in this chapter because it provides fewer details about student skills. Nevertheless, this rubric can be useful because it focuses more on the overall approach used by a student and provides a holistic way of looking at student responses. You might want to use this rubric in conjunction with one of the other rubrics.

This rubric probably should not be used as feedback to students because the pattern descriptions use language that might not be accessible to students, and some of the descriptions are quite negative. It is probably more beneficial to help students focus on positive ways they can improve performance than on negative aspects of their response.

Procedures for using this rubric are shown in Exhibit 4.4, and examples are provided in Appendix E.

Rubric #2: Steps for Better Thinking Rubric

The Steps for Better Thinking Rubric presented in Appendix A (p. A-5) is a more detailed rubric that you can use to assess performance patterns. Notice that the rubric includes the same columns shown in the preceding rubric, so it is once again theoretically and empirically grounded in the developmental models discussed in Chapter 2.

The rubric contains a row for the student's overall approach to a problem, plus individual rows for each of the skills in Steps for Better Thinking (Appendix A, p. A-2). The shaded boxes on the rubric highlight major skill improvements and correspond with the "stairs" in Steps for Better Thinking. When reading a single row of from left to right, the columns to the left of the shaded box describe performance that does not meet the minimum standard for that skill. The columns to the right of the shaded box describe performance that goes beyond the minimum standard for that skill.

This rubric is somewhat difficult to use at first because the individual skill descriptions are quite brief. For raters having a strong understanding of the performance patterns in Chapter 2, however, the reliability of this rubric is high.¹ Its reliability makes this rubric a good choice for research projects or for program/college assessments.

This rubric probably should not be used as feedback to students because it uses language that is too complex for most students, and the descriptions of weaknesses are negative. It is probably more beneficial to help students focus on positive ways they can improve performance than on negative aspects of their response.

Procedures for using this rubric are shown in Exhibit 4.5, and examples are provided in Appendices E and F.

¹ Susan Wolcott and Cindy Lynch usually achieved interrater agreement of 80-90% using this rubric. At least 70% is usually considered reliable.

Exhibit 4.4
Procedures for Using Rubric #1
Steps for Better Thinking Performance Patterns
(Appendix A, p. A-3)

1. Use one copy of the rubric for each assessment.
2. Review the performance carefully. If it is written, underline key statements made by the student that provide clues about the student's underlying thinking (use Chapter 2 as a guide).
3. Circle or highlight individual bullet points (major improvements and/or weaknesses) on the rubric that describe the student's performance. Because the descriptions become more complex as you move from left to right in the rubric, it is usually easiest to look for the student's performance beginning at the left and moving to the right.
4. It is common for individual characteristics of a student's performance to span two adjacent columns, but it is rare for a student's skills to span more than two columns. This type of finding usually means that there are problems with the ratings, the assessment assignment, or the quality of the student's response. If you have identified characteristics beyond two adjacent columns, carefully review your work and consider whether the response contains sufficient information to be ratable.
5. Circle or highlight the overall approach which best matches the strengths and weaknesses you identified above. Although individual characteristics may span two columns, you should select only one overall approach.
6. Avoid overrating student skills by giving them the "benefit of the doubt," particularly for students having strong written communication skills.
7. Keep in mind that you are looking for patterns in the student's thinking. Do not allow your assessment to be unduly influenced by individual words in a student's response that suggest a pattern different than the overall work.
8. Try to identify and control for your "hot buttons" while performing skill assessments. For example, if you believe it is essential for students to reach and defend a position/thesis, you might tend to overrate the Biased Jumper (Performance Pattern 1) and underrate the Perpetual Analyzer (Performance Pattern 2).
9. Review the circled/highlighted items and classify the student's overall performance pattern as either: (a) predominantly in one column (i.e., "0," "1," "2," "3," or "4") or (b) a mixture of two adjacent columns (i.e., "0.5," "1.5," "2.5," or "3.5").
10. If the student's response does not provide enough information to adequately classify the student's skills, assess that response as "unable to rate."

Exhibit 4.5
Procedures for Using Rubric #2
Steps for Better Thinking Rubric
(Appendix A, p. A-5)

1. Use one copy of the rubric for each assessment.
2. Review the performance carefully. If it is written, underline key statements made by the student that provide clues about the student's underlying thinking.
3. First consider the student's overall approach to the problem (row H, at the bottom) and circle or highlight the closest description on the rubric—i.e., item H0, H1, H2, H3, or H4. If you are having trouble recognizing the overall approach, refer to the Steps for Better Thinking Performance Patterns (rubric #1 in this chapter) for additional guidance.
4. Next, go through the rest of the rubric row-by-row (A through G) and identify and circle or highlight the single best description within each row. You can do this in any order, but it will probably be easiest to begin at the top and move down. Because the descriptions become more complex as you move from left to right along a row, it is usually easiest to look for the student's performance beginning at the left and moving to the right.
5. Sometimes a student does not fully exhibit the skills described in the cell that contains the best match. In that case, circle/highlight only the part(s) exhibited.
6. Avoid overrating student skills by giving them the "benefit of the doubt," particularly for students having strong written communication skills. Do not circle/highlight a description unless the performance demonstrates it. (However, students might not explicitly discuss uncertainties. Sometimes you must infer their understanding of uncertainties based on the way they discuss and evaluate information and perspectives.)
7. Keep in mind that you are looking for patterns in the student's thinking. Do not allow your assessment to be unduly influenced by individual words in a student's response that suggest a pattern different than the overall work.
8. Try to identify and control for your "hot buttons" while performing skill assessments. For example, if you believe it is essential for students to reach and defend a position/thesis, you might tend to overrate the Biased Jumper (Performance Pattern 1) and underrate the Perpetual Analyzer (Performance Pattern 2).
11. If you find that your assessments of items A through H span more than two columns, carefully review your work. It is rare for a student's skills to span more than two columns. This type of finding usually means that there are problems with the ratings, the assessment assignment, or the quality of the student's response. Consider whether the response contains sufficient information to be ratable.
12. Review your assessments of items A through H and classify the student's overall performance pattern as either: (a) predominantly in one column (i.e., "0," "1," "2," "3," or "4") or (b) a mixture of two adjacent columns (i.e., "0.5," "1.5," "2.5," or "3.5").
13. If a student's response does not provide enough information to adequately classify the student's skills, assess that response as "unable to rate."

Rubric #3: Steps for Better Thinking Competency Rubric

The Steps for Better Thinking Competency Rubric presented in Appendix A (p. A-6) is designed primarily to be used for student feedback. It avoids negative descriptions (resulting in many blank cells), and points students toward ways they can improve their performance. However, you might consider removing the labels (e.g., “Confused Fact-Finder”) when giving the rubric to students.

This rubric includes the same columns shown in the preceding two rubrics, so it is once again theoretically and empirically grounded in the developmental models discussed in Chapter 2. The rubric contains a row for the student’s overall approach to a problem, plus individual rows for each of the skills in Steps for Better Thinking (Appendix A, p. A-2). But instead of rating each skill at a single level, ratings on this rubric are cumulative from left to right. Thus, ratings on this rubric reflect the building of skills across performance patterns.

This rubric is relatively easy to learn how to use because it includes little detail for the most common performance patterns (0, 1, and 2) and focuses raters’ attention on the skills that emerge with each performance pattern.

This rubric is slightly less reliable than the Steps for Better Thinking Rubric because it includes less complete descriptions of the individual skills. However, it is sufficiently reliable for classroom use and perhaps also for program/college assessment purposes. Reliability is higher for a rater who has a strong understanding of the performance patterns in Chapter 2.

Procedures for using this rubric are shown in Exhibit 4.6, and examples are provided in Exhibits D, E, F, and G.

Rubric #4: Washington State University Critical Thinking Rubric – Modified by Jerry Stonewater & Susan Wolcott

The fourth rubric is adapted from a critical thinking rubric developed at Washington State University, or WSU (the original rubric can be downloaded at wsuctproject.wsu.edu/ctr.htm). The original WSU rubric listed a series of critical thinking skills. Two levels were described for each skill: “Emerging” and “Mastering.” In October 2005, Jerry Stonewater² and I created the modified version shown in Appendix A, pp. A-7 to A-9. This version of the rubric describes performance for each skill using the performance pattern descriptions shown in Chapter 2. However, as a simplification for use in undergraduate courses, the two highest performance patterns are combined into a single column.

This rubric is relative new, so its reliability has not yet been evaluated. However, because the columns are theoretically and empirically grounded in the developmental models discussed in Chapter 2, its reliability is probably moderate to high for raters having a strong understanding of the performance patterns in Chapter 2. However, reliability will be lower for professors who reduce the length of the rubric as suggested in Exhibit 4.7.

Procedures for using this rubric are shown in Exhibit 4.7.

² Jerry is University Director of Liberal Education and Assessment at Miami University (Ohio). Jerry and his colleagues at Miami University had used the WSU rubric, and they liked the list of skills contained in the rubric.

Exhibit 4.6
Procedures for Using Rubric #3
Steps for Better Thinking Competency Rubric
(Appendix A, p. A-6)

1. Use one copy of the rubric for each assessment.
2. Review the performance carefully. If it is written, underline key statements made by the student that provide clues about the student's underlying thinking.
3. First consider the student's overall approach to the problem (the bottom row) and circle or highlight the closest description on the competency rubric. If you are having trouble recognizing the overall approach, refer to the Steps for Better Thinking Performance Patterns (rubric #1 in this chapter) for additional guidance.
4. Next, identify and circle or highlight all skills exhibited by the student. You can do this in any order, but it will probably be easiest to do this row-by-row. Begin at the top of the rubric, and move from left to right. Beginning with the left-most skill in a row, determine whether or not the student's performance exhibits the skill. If so, circle/highlight the skill and continue one cell to the right. If not, skip that row and move to the next row. (If a student does not exhibit the skill in a particular cell, then the student will not exhibit the skills in any cells to the right on the same row.)
5. Sometimes a student exhibits only part of a skill. In that case, circle/highlight only the part(s) exhibited.
6. Avoid overrating student skills by giving them the "benefit of the doubt," particularly for students having strong written communication skills. Do not circle/highlight a description unless the performance demonstrates it. (However, students might not explicitly discuss uncertainties. Sometimes you must infer their understanding of uncertainties based on the way they discuss and evaluate information and perspectives.)
7. Keep in mind that you are looking for patterns in the student's thinking. Do not allow your assessment to be unduly influenced by individual words in a student's response that suggest a pattern different than the overall work.
8. Try to identify and control for your "hot buttons" while performing skill assessments. For example, if you believe it is essential for students to reach and defend a position/thesis, you might tend to overrate the Biased Jumper (Performance Pattern 1) and underrate the Perpetual Analyzer (Performance Pattern 2).
9. Students with very weak skills might have only one skill circled/highlighted on the entire rubric—typically, "Identifies facts, definitions, and/or experts' opinions."
10. When you are finished circling/highlighting skills, determine the student's performance pattern by identifying the right-most column containing marked items. If the majority of skills in that column are circled/highlighted, then the student's rating is the performance pattern for that column. If a student's right-most skills appear to be split between two adjacent columns, then the rating is half-way between those two performance patterns (e.g., 1.5 for a rating between 1 and 2).
11. It is rare for a student's highest performance to be spread across more than two performance patterns. This type of finding usually means that there are problems with the ratings, the assessment assignment, or the quality of the student's response. You should carefully review the ratings and consider whether the response contains sufficient information to be ratable.
12. Sometimes a student's response does not provide enough information to adequately classify the student's skills. Assess that response as "unable to rate."
13. Compare your skill rating with your initial rating from #3 above. They should agree within 0.5. If not, review and revise your ratings.

Exhibit 4.7
Procedures for Using Rubric #4
Washington State University Critical Thinking Rubric – Modified
by Jerry Stonewater & Susan Wolcott
(Appendix A, pp. A-7 to A-9)

The procedures for using this rubric are basically the same as for the Steps for Better Thinking Rubric (Exhibit 4.5). However, this rubric combines the highest two performance patterns into a single column.

This rubric is quite long, so professors who use it for classroom assignments might want to reduce its length. Here are suggestions for doing this:

- Always include the “Overall Approach to Critical Thinking” row at the top of the rubric.
- Of the remaining 8 rows, eliminate all but about 2-3 rows which describe the most important skills for the course/assignment.

Choosing Among the Four Rubrics

Exhibit 4.8 provides a table summarizing the uses, strengths, and weaknesses of the four rubrics introduced in this chapter.

Research Data on Performance Patterns

The majority of college students do not exhibit high competency levels. The following table summarizes the skill levels of students throughout the United States in a variety of institutions and disciplines, based on 20 years' empirical research summarized in Table 6.6 in King and Kitchener, 1994. Performance Patterns 1, 2, 3, and 4 correspond to the skills in Reflective Judgment Stages 4, 5, 6, and 7, respectively (means in the table have been adjusted accordingly).

	Mean Performance Pattern	Std Dev	Sample Size
Traditional-Aged Undergraduate Students:			
Freshman	0.63	0.53	329
Sophomore	0.57	0.43	89
Junior	0.74	0.59	159
Senior	0.99	0.67	369
Nontraditional-Aged Undergraduate Students:			
Freshman	0.57	0.42	78
Senior	0.98	0.74	46
Master's/Early Doctoral	1.62	0.81	126
Advanced Doctoral	2.27	0.89	70

The assessment method used for the above data was the Reflective Judgment Interview (see King & Kitchener, 1994). The interview provided low support, meaning that there was little guidance or incentive for students to demonstrate high performance. Expect students to perform somewhat higher when given greater amounts of support in conjunction with a coursework assignment (see Kitchener, Lynch, Fischer & Wood, 1993). As discussed earlier in this chapter, it is important to consider the context of the assessment (including the type of support provided) when evaluating assessment results.

Exhibit 4.9 reports the distribution of performance patterns in two sophomore-level and two MBA accounting classrooms. Although performance in one of the sophomore classrooms was unusually strong, there were wide variations in student performance in all four classrooms. This variation highlights the need for faculty to assess student skills so that they can better address the learning needs of students in their courses. Also, these demonstrate that graduate-level students do not always perform significantly higher than undergraduate students.

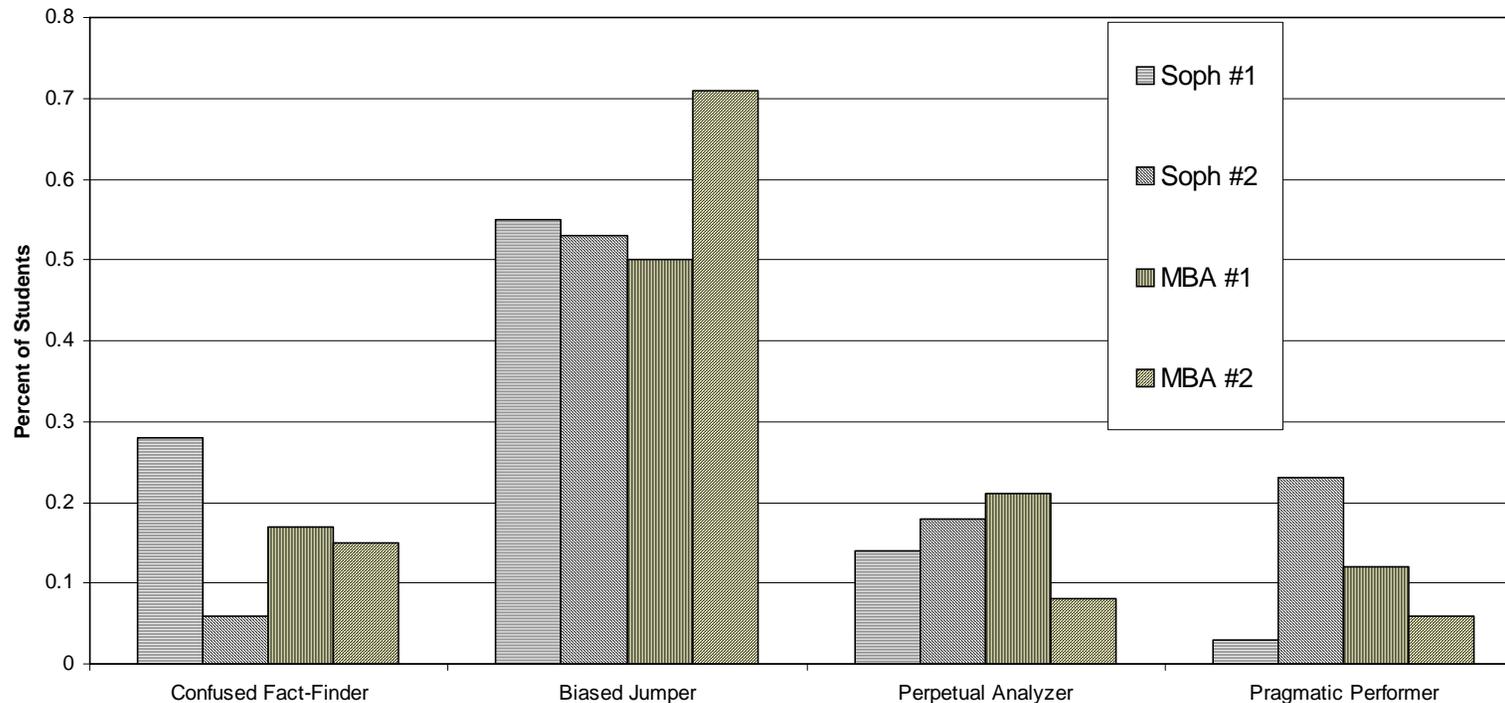
Exhibit 4.8

Summary of Uses, Strengths, & Weaknesses for Four Rubrics

Rubric	Uses, Strengths, and Weaknesses
Steps for Better Thinking Performance Patterns (Appendix A, p. A-3)	<ul style="list-style-type: none"> • Holistic analysis of overall student approach • Relatively easy to use • Moderate reliability • Use in conjunction with another rubric
Steps for Better Thinking Rubric (Appendix A, p. A-5)	<ul style="list-style-type: none"> • Detailed descriptions for skills in Steps for Better Thinking • More difficult to use • High reliability • Use for research or program assessment
Steps for Better Thinking Competency Rubric (Appendix A, p. A-6)	<ul style="list-style-type: none"> • Focuses only on positive aspects of performance • Relatively easy to use • Moderate to high reliability • Use for feedback to students (but consider removing the labels such as “Confused Fact-Finder”)
Washington State University Critical Thinking Rubric – Modified by Jerry Stonewater & Susan Wolcott (Appendix A, pp. A-7 to A-9)	<ul style="list-style-type: none"> • Detailed descriptions for skills identified by WSU • Relatively easy to use • Reliability unknown, but probably moderate to high • Might be too long for student feedback, but less important skills could be eliminated for classroom use

Exhibit 4.9

Performance Patterns in Four Accounting Classrooms



The data reported here come from settings where students were asked to address an open-ended problem without the types of support for higher performance (including explicit prompts for each skill level) recommended in Chapter 3. The sophomore student data, reported in Wolcott & Lynch (1997), are from a third-quarter introductory financial accounting course taken only by accounting majors. Particularly for “Soph #2,” the data demonstrate higher than typical sophomore-level performance according to the body of reflective judgment research reported in King and Kitchener (1994). The MBA student data are from evening (MBA #1) and daytime (MBA #2) introductory financial accounting courses and are typical of master-level performance according to the body of reflective judgment research reported in King and Kitchener (1994). No performances in these classes were rated at Performance Pattern 4 (Strategic Re-Visioner).

Start on a Small Scale

The recommendations in this chapter can at first seem overwhelming. If you would like to get started on a much smaller scale, consider asking just one carefully crafted essay question on your next exam. See the examples in Chapter 3 for ideas of problems and question design. Or, consider the “One-Paragraph Assignment: Identify and Describe Uncertainties” shown in Chapter 3 (pp. 3-3 and 3-4).

An assessment having smaller scope necessarily provides limited information about critical thinking skills. However, for students who are able to answer even a less complex question very well, this task would provide you with useful information. In addition, a smaller assessment task help you begin to think about your students’ performances from a developmental perspective.

Chapter 4 References

Fischer, K. W., & Pruyne, E. (2002). Reflective thinking in adulthood: Development, variation, and consolidation. In J. Demick & C. Andreoletti (Eds.), *Handbook of Adult Development* (pp. 169-197). New York: Plenum.

Gainen, J. and Locatelli, P. (1995). *Assessment for the New Curriculum: A Guide for Professional Accounting Programs*. Accounting Education Series, Vol. 11. Sarasota: Accounting Education Change Commission and American Accounting Association.

King, P. M., and Kitchener, K. S. (1994). *Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults*. San Francisco: Jossey-Bass.

Kitchener, K. S., Lynch, C. L., Fischer, K. W., and Wood, P. K. (1993). Developmental range of reflective judgment: The effects of contextual support and practice on developmental stage. *Developmental Psychology*, 29, 893-906.

Palomba, C. A., and T. W. Banta. 1999. *Assessment Essentials*. San Francisco, CA: Jossey-Bass.

Pellegrino, J., Chudowsky, N., and R. Glaser (eds.). (2001). *Knowing What Students Know: The Science and Design of Educational Assessment*. Report of the National Research Council, Center for Education, Division on Behavioral and Social Sciences and Education. Washington, D. C.: National Academy Press. Can be obtained at: www.nap.edu/catalog/10019.html.

Wolcott, S. K. (2005). Assessment of critical thinking. In T. G. Calderon & K. D. Martell (Eds.) *Assessment of Student Learning in Business Schools: Best Practices Each Step of the Way*, Vol 1, No. 1. AACSB International and Association for Institutional Research (AIR). Available at www.AACSB.edu/ARC.

Wolcott, S. K., and Lynch, C. L. (1997). Critical thinking in the accounting classroom: A reflective judgment developmental process perspective. *Accounting Education: A Journal of Theory, Practice and Research*, 2(1), 59-78.

Suggested Professor Activities

The following activities are designed to help you reflect upon and implement the ideas presented in this chapter. You may wish to engage in these activities individually or with colleagues.

1. Practice using the four rubrics on the student examples provided in Appendices B through G.
 - Compare your assessments to the annotated ones. Were there any major differences? What might be the cause? Re-read Chapter 2 and the assessment guidelines in this chapter to clarify your understanding of student performance patterns.
 - Given the assessment of each student's performance pattern, determine which skills each student should next work on developing.
2. Practice using one or more of the rubrics to assess performance for an assignment in a course you teach.
 - Summarize your assessment results and evaluate the distribution of performance in your class. What does this suggest about how you teach the course?
 - Document the context of your assessment using the guidance in Appendix I. Consider how the context affected your students' performance.
 - Given what you learned about your students' performance patterns, what might you change about the way you teach the course? Refer to Chapter 3 for ideas.
 - Given what you learned from your assessment experience, consider whether you would like to modify the assignment to gather better information about students' skills.
3. Practice assessing only one or two skills by having students write a paragraph as a homework assignment or as part of an examination. For ideas, refer to Chapter 3.
 - Use one of the rubrics to help you identify levels of student performance. Keep in mind that you will probably not be able to assess performances higher than the level of the task. For example, if you asked students to describe strengths and weaknesses of two competing theories (a Step 2 task), you will probably not be able to assess performances higher than Step 2.
 - Evaluate the types of weaknesses exhibited by your students, and consider how you might be able to help students overcome those weaknesses in the future.
 - If many students performed poorly on the assessment task, consider having students write another paragraph aimed at the next lower set of skills. For example, if you previously asked students to address a Step 2 task, ask them a Step 1 task. Re-evaluate your students' strengths and weaknesses in light of what you have learned.

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