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Helping Your Students Develop Critical Thinking Skills

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Students exhibit different patterns of thinking skills and respond differently to what we do in our classes. As the following example demonstrates, even brief moments of conversation can reveal differences among students.

Ida: What did you think about the first day of Professor Jones' class?

Forrest: Well, I was hoping to learn a lot from Professor Jones. I heard she is a good teacher, and I'm disappointed that we spent so much time talking about theories and uncertainties. If experts like Professor Jones won't give us the right answers, how are we supposed to know what is going on?

Eric: That's an interesting question. I'm hoping to learn from Professor Jones, too.

Ida: I don't think anybody knows for sure about things like complicated theories. There are so many factors involved; you just have to go with what makes sense to you.

Eric: Well, the world certainly is complex. I need a lot more information about different theories, available evidence, and how different experts interpret the evidence before I can make a well-informed decision about which theories are best. I believe Professor Jones' class will help me gather information and think more clearly about it.

Teachers strive to help students like Forrest, Ida, and Eric develop stronger thinking skills, and we'll return to their conversation later in this paper. Better thinking and practical problem solving skills are promised in higher education mission statements, course syllabi, and lists of desired student learning outcomes. There are many ways to talk about thinking skills. Terms such as critical thinking, scientific methods, professional or clinical judgment, problem-based inquiry, decision making, information literacy, strategic planning, and life-long learning represent thinking processes. For almost every profession, scholars and practitioners have put forth models for thinking through problems and offered suggestions for making better professional judgments. Discussions of thinking skills can be found in the education literature, too, including the famous work of Dewey (1933/1963) and Bloom et al. (1956). Unfortunately, while teachers are aware of many of the skills they would like students to exhibit, the steps between typical student performance and desirable performance often remain unarticulated or vague. This limits teachers' capacities to understand and enhance skill development.

In this paper, we recommend theoretically grounded and empirically supported strategies teachers can use to improve the development and assessment of students' thinking skills. Our transdisciplinary approach links a series of increasingly complex Steps for Better Thinking to two theories from developmental psychology: Fischer's dynamic skill theory (Fischer, 1980; Fischer & Bidell, 1998) and King and Kitchener's (1994) reflective judgment model of cognitive development. We use these theories and relevant empirical data as a map for structuring our efforts to optimize students' thinking skills.

First we present Steps for Better Thinking, which can be conceptualized as the skills in a developmentally grounded problem solving or inquiry process. Next we present and provide examples of using a rubric to examine thinking skill patterns students typically exhibit. A brief overview of the theoretical and empirical underpinnings follows. Then our discussion moves to the implications of this work for assisting students as they attempt to think critically. We share examples of tasks that can be adapted for learning purposes in any course or experiential setting. The tools provided here can help you be more deliberate in your efforts to understand and enhance students' thinking skills.

Steps for Better Thinking

Many of the tasks we assign to students require them to correctly recognize, repeat, or paraphrase information found in their textbooks or class notes. However, effective personal and professional functioning requires dealing with open-ended problems that are fraught with significant and enduring uncertainties about such issues as the scope of the problem, interpretations of relevant information, range of solution options, and potential outcomes of various options. Here are a few examples of open-ended professional, personal, and civic problems:

Professional problems
- What is the best interpretation of a piece of literature?
- What is the best way for a teacher to help students grow and learn?
- How can a leader most efficiently promote effective team work?

Personal problems
- What should I do to optimize my career development?
- What, if any, vitamin supplements should I use?
- What is the best way to care for my frail grandmother?

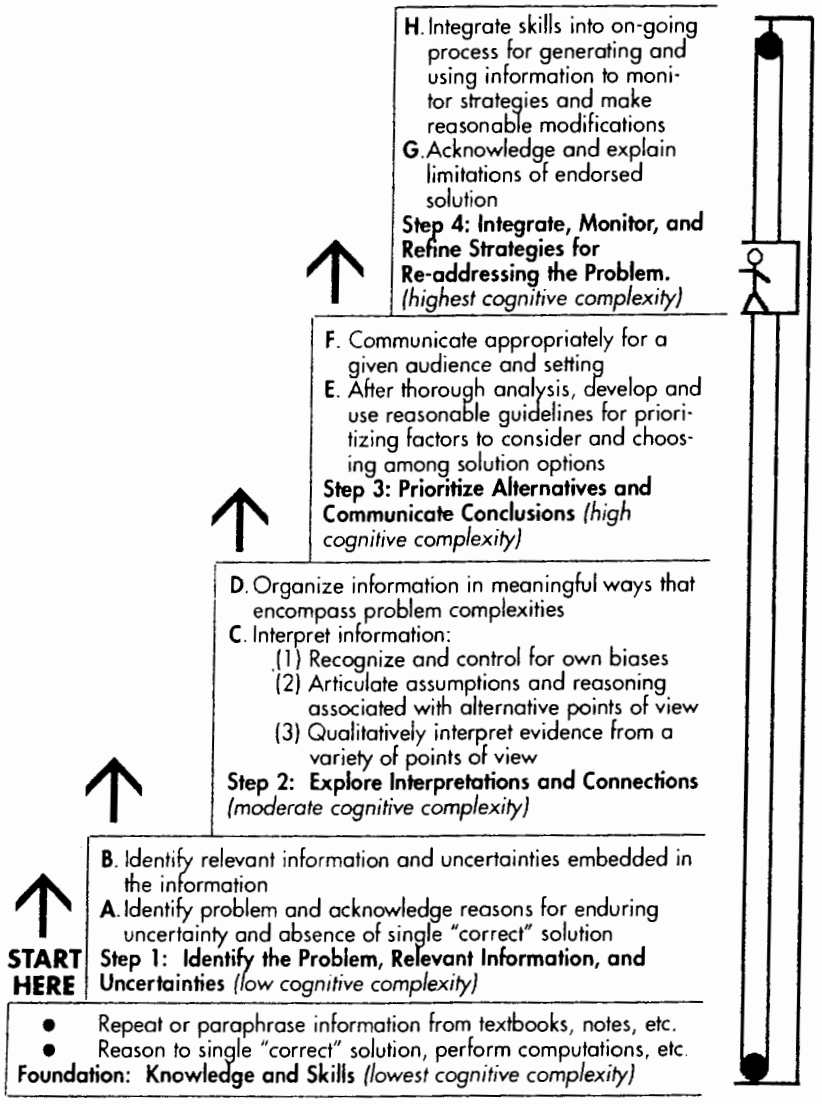
Civic problems
- Should I volunteer with a particular nonprofit organization?
- How should I vote on a particular ballot initiative?
- What are the most important things I can do to improve schools in my community?

Figure 1 illustrates developmentally-grounded Steps for Better Thinking that could be used to help students think about open-ended problems:

Step 1—identify the problem, relevant information, and uncertainties;
Step 2—explore interpretations and connections;
Step 3—prioritize alternatives and communicate conclusions; and
Step 4—integrate, monitor, and refine strategies for re-addressing the problem.

The figure should be read from bottom to top; each upward step represents a "building block" of increasingly complex skills. Items A-H list more specific subskills for each step.

Figure 1
Steps for Better Thinking: A Developmental Problem Solving Process



Think of the construction elevator on the right side of Figure 1 as someone's (a) awareness of a thinking or problem solving process and (b) willingness to attempt the tasks associated with steps in the process. The steps (skills), which can be accessed using the elevator, do not magically appear. A student must construct each step over time through practice in a supportive learning environment. The student can access his or her expanding foundation of information through the basement or foundation level illustrated in Figure 1.

A thinker'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. Look again at Figure 1, and imagine what would happen if someone stepped out of an open elevator door into a space where the step (skill) has not been sufficiently constructed. The thinker risks a dangerous fall—failure to adequately address the problem at hand.

Understanding Patterns of Thinking Skills

Figure 2 provides information about how people with different skill patterns are likely to respond to controversial problems and issues. Moving from left to right across the columns, one finds descriptions of increasingly complex and effective approaches based on Steps for Better Thinking. Let's return to our prototypic students, Forrest Foundation, Ida Identify, and Eric Explore. They provide hints about their thinking skills patterns in the conversation about Professor Jones' class. Look carefully at Figure 2. Which skill pattern best describes each of the students?

Forrest Foundation expects authorities like Professor Jones to "give us the right answers," even to open-ended problems that do not have absolutely correct answers, so Skill Pattern 0 best describes Forrest. Ida Identify acknowledges that no one can know for sure and suggests that "you just have to go with what makes sense to you." Further exploration with Ida probably would reveal that although she can stack up evidence to support her opinion (Skill Pattern 1), she has difficulty qualitatively interpreting information from different points of view (a characteristic of Skill Pattern 2). In contrast, Eric Explore exhibits a more sophisticated way of thinking about open-ended problems (at least Skill Pattern 2) when he speaks of exploring a wide range of information and taking time to "think more clearly about it."

Unlike many other assessment rubrics, the rubric presented in Figure 2 is theoretically and empirically grounded. Using this rubric helps faculty:

- Quickly gain insights about student strengths and weaknesses.
- Identify the "next steps" in building student competencies.
- Provide students with more appropriate feedback.
- Achieve high interrater reliability with other faculty members.

Figure 2 is organized based on what we have learned about how cognitive skills develop in adolescents and adults. It is rare that all aspects of a student's performance fit neatly into a single column; a person's performance in a particular setting typically spans two adjacent columns. Because the rubric is developmentally grounded, it is very rare to evaluate a performance that fits descriptors in non-adjacent columns.

Figure 2
Steps for Better Thinking Skill Patterns

←Less Complex Skill Patterns — More Complex Skill Patterns→

Skill Pattern 0 Step 1,2, 3, & 4 skills weak	Skill Pattern 1 Step 2, 3, & 4 skills weak	Skill Pattern 2 Step 3 & 4 skills weak	Skill Pattern 3 Step 4 skills weak	Skill Pattern 4 Intergrates Step 1,2, & 3 skills
Overall Problem Approach: Proceeds as if goal is to find the single, "correct" answer	**Overall Problem Approach:** Proceeds as if goal is to stack up evidence and information to support conclusion	**Overall Problem Approach:** Proceeds as if goal is to establish a detached, balanced view of evidence and information from different points of veiw	**Overall Problem Approach:** Proceeds as if goal is to come to a well-founded conclusion based on objective comparisons of viable alternatives	**Overall Problem Approach:** Proceeds as if goal is to construct knowledge, to move toward better conclusion or greater confidence in conclusions as the problem is addressed over time
Common Weaknesses: • Fails to realistically perceive uncertainties/ambiguities • Recasts open-ended problem to one having a single "correct" answer • Insists that the experts should provide "correct" answer • Expresses confusion or futility • Uses illogical arguments • Cannot evaluate or appropriately apply evidence • Inappropriately cites textbook, "facts," or definitions • Concludes based on unexamined authorities' views or what "feels right"	**Major Improvements Over Less Complex Skill Pattern:** • Acknowledges existence of enduring uncertainties and multiple perspectives • Reaches own conclusion without relying exclusively on authority **Common Weaknesses:** • Jumps to conclusions • Stacks up evidence quantitatively to support own view point and ignores contrary information • Confuses evidence and unsupported personal opinion • Inept at breaking problem down and understanding multiple perspectives • Insists that all opinions are equally valid, but discaunts other opinions • Views experts as being opinionated or as trying to subject others to their personal beliefs	**Major Improvements Over Less Complex Skill Pattern:** • 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 **Common Weaknesses:** • Reluctant to select and defend a single overall solution as most viable • 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	**Major Improvements Over Less Complex Skill Pattern:** • After thorough exploration, consciously prioritizes issues and information • Articulates well-founded support for choosing one solution while objectively considering other viable options • Conclusion based an qualitative evaluation of experts' positions or situational pragmatics **Common Weaknesses:** • Conclusion doesn't give sufficient attention to long-term, strategic issues • Inadequately identifies and addresses solution limitations and "next steps"	**Major Improvements Over Less Complex Skill Pattern:** • Prioritizes and addresses limitations effectively • Interprets and reinterprets bodies of information systematically over time as new information becomes available • Exhibits a practical, long-term vision • Spontaneously considers possible ways to generate new evidence about the problem **Common Weaknesses:** • Not applicable

Theoretical and Empirical Underpinnings

The skills articulated in Steps for Better Thinking (Figure 1) do not develop automatically as we get older and accumulate more experience. Although professional and personal experiences constantly confront adults with open-ended problems that do not have absolutely "correct" solutions, some individuals are better prepared than others to deal with such issues. Substantial data clearly indicate that most college graduates exhibit very limited skills for effectively addressing open-ended problems (e.g., Eyler & Giles, 1999; King & Kitchener, 1994; Langer, 1989; Wolcott & Lynch, 1997). In this section, we discuss very briefly the theoretical and empirical underpinnings of the sequence depicted in Figure 1.

King and Kitchener's (1994) reflective judgment model describes a developmental progression of seven qualitatively different levels, or stages, of reasoning strategies that might be applied to open-ended problems, as well as sets of assumptions about knowledge that underlie those strategies. The steps identified in Figure 1 are related to four of the stages: Skills associated with Step 1 (identify in Figure 1) are embedded in the scoring rules for Reflective Judgment Stage 4, and Steps 2 (explore), 3 (prioritize), and 4 (integrate) are associated with Reflective Judgment Stages 5, 6, and 7, respectively (King & Kitchener, 1985/1996).

Pascarella and Terenzini (1991) described the reflective judgment model as "perhaps the best known and most extensively studied" (p. 123) model of adult cognitive development. Hofer and Pintrich (1997) reported it to be the "most extensive developmental scheme with epistemological elements... It has been widely used by others interested in the construct and may be most useful for teachers who see reflective judgment as a desirable educational outcome" (pp. 102-103). Over the last 25 years, researchers have validated the reflective judgment model using carefully designed longitudinal and cross-sectional research with male and female college students. These studies offer empirical support for its use in college-level coursework design (King & Kitchener, 1994, Chapter 6).

When certified raters evaluated Reflective Judgment Interview data from more than 1,300 students, data patterns consistently indicated that thinking skills develop in the sequence outlined in Figure 1 (King & Kitchener, 1994). Many college freshmen do not consistently exhibit Step 1 skills, and Wolcott and Lynch (1997) reported that more than 10% of students in an introductory master's level course did not consistently exhibit Step 1 skills. Research has revealed slow, gradual improvements in Step 1 skills during the undergraduate years. Like Ida Identify, most college seniors, regardless of age, exhibit Step 1 skills but are still struggling with Step 2, 3, and 4 skills (King & Kitchener, 1994). This means that, although they may be able to compile reasons and evidence to support their opinions, they are rarely able to examine an issue thoroughly from multiple points of view, taking into account how assumptions, bias, and previous experience impact different interpretations of a body of information.

Our assertions are also based on Fischer's (1980; Fischer & Bidell, 1998) dynamic skill theory. This comprehensive theory of human development identifies underlying structures in human development and stresses the necessity of collaboration between the person and his or her environment in the performance of increasingly complex skills. In recent years, dynamic skill theory has become very highly regarded among developmental psychologists, as indicated by its prominence in the most recent *Handbook of Child Psychology* (Fischer & Bidell, 1998; W. Damon, series editor). Kitchener and Fischer (1990) discussed how the reflective judgment model relates conceptually to dynamic skill theory. The research reported in Kitchener, Lynch, Fischer, and Wood (1993) supports the relationship between the two models.

According to Fischer's dynamic skill theory (Fischer, 1980; Fischer & Bidell, 1998), the skills described in our Steps for Better Thinking are self-scaffolding. This means that earlier steps in the process provide necessary support for performance in later, more complex steps. When performance in one step of the process is poor, performance in subsequent steps is also likely to be poor. For example, if an open-ended problem fraught with enduring uncertainties is mistaken for a highly structured problem that has a single correct answer (weak step 1 skills), performance in all higher steps (explore, prioritize, integrate) is likely to be weak. If the thinker recognizes the open-ended nature of a problem but does not adequately explore relevant information from multiple points of view, the thinker's attempts to establish priorities for conclusions and integrate strategies for further consideration of the problem are also likely to be weak.

This notion of self-scaffolding skills has important implications for how we design learning environments and understand student performance. It is the reason we use a stair-step representation in Figure 1—more complex skills require the support of less complex skills.

Designing Appropriate Educational Experiences

Each group of students is likely to present diverse skill development needs (King & Kitchener, 1994; Wolcott & Lynch, 1997). Learning to watch for clues about your students' needs is not too difficult, once you become aware of the developmental progression of skill development described in Figures 1 and 2. In brief but carefully structured workshop sessions, we have seen faculty rate student writing samples with acceptable interrater reliability.

Teachers who do not understand how thinking skills develop may overestimate student skills and assign coursework that is unreasonably complex. Without adequate support, students become overwhelmed and perform poorly. When expectations are too complex, teachers often become frustrated with students' performance and revert to low complexity coursework that fails to encourage student development of complex thinking skills.

We believe a major reason college students fail to exhibit more complex thinking skills is because their educational experiences have provided limited support for skill development and for optimal performance. Dewey (1938/1963) and Fischer (1980) both emphasized that development of complex thinking skills depends on appropriate experiences. The potential value of learning experiences may be judged by the degree to which they (a) build on previous experiences, (b) provide developmentally appropriate opportunities for the individual to produce optimal performance, and (c) lay a foundation for further development.

Figure 3 presents task prompts for each step in the problem solving process that can be adapted to provide students with appropriate challenge and guidance as they address controversial issues and construct the skill steps. Because most college students are not performing with very complex thinking skills, we suggest that you break down assignments or discussions into a series of tasks that address different levels in Steps for Better Thinking. Use at least one task aimed at the lowest expected level of performance for students in the class. Emphasize questions aimed at (a) the current ability of the average student n the class and (b) one level higher than the current ability of the average student. To challenge students who have above 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 of development for the class.

Based on the research evidence, classes directed to freshmen and sophomores typically should focus on tasks for Step 1; upper-class undergraduates need more focus on questions for Step 2; and graduate students may be ready to focus on questions for Steps 3 and 4. However, because of the self-scaffolding nature of these steps, teachers must monitor student performance and adjust expectations if many students seem to be struggling. Wolcott (2000) provides an illustration of how questions for an accounting case could be designed for typical sophomore, junior/senior, and master course levels.

This paper presents three primary tools for teachers: a developmental problem solving process, an assessment rubric, and tasks that require increasingly complex thinking skills. These tools can be utilized in a variety of ways in individual courses or other educational activities and in degree programs.[1] We suggest that teachers begin using these tools as follows:

- **Gather baseline data.** Start small by assessing your students' current performance. Ask students to write about an open-ended problem, and use the rubric in Figure 2 to develop an understanding of their current thinking skills. It may be most practical for you to take an assignment or discussion problem you currently use and practice writing questions/tasks aimed at different skill levels. Use the tasks in Figure 3 as a guide. Design the assignment so you will have some data about each of the steps, and be sure to include something about Step 1 uncertainties.

- **Refine coursework slowly over several semesters based on identified student developmental needs.** Begin to structure assignments, classroom discussions, and other activities to follow the sequence in Figures 1 and 3. This will allow students who exhibit less complex skill patterns to participate as actively as possible, and it will provide students exhibiting more complex skill patterns opportunities to develop skills beyond the average student.

- **Pay particular attention to weaknesses in students' Step 1 skills**—identifying the problem, relevant information, and uncertainties. When professors incorrectly assume that students have mastered this set of skills, student confusion and poor performance are inevitable.

- **Introduce students to Steps for Better Thinking** (Figure 1) and ask them to explicitly use the process as they address open-ended problems. Students are more likely to develop skills if they understand the goals and receive explicit feedback about their performance. It may be helpful to refer students to our free, on-line tutorial (Lynch, Wolcott & Huber, 2001). Consider asking students to self-evaluate their performance (see Wolcott, 1999).

- **Recognize that development of thinking skills requires students to give up their old ways and adopt new ways of thinking about the world.** This can be stressful for students who are comfortable with their old ways of thinking. Encourage and assist students by (1) setting realistic expectations for student development based on their current thinking skills, (2) helping students recognize the importance of developing more complex ways of thinking, (3) allowing students sufficient time and practice to experience success in these new ways of thinking, and (4) supporting students in their efforts through encouragement and constructive feedback.

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[1] For additional information and examples, visit our web site: http://www.WolcottLynch.com (WolcottLynch, 2001)

Figure 3
Task Prompts for Different Levels in ⛰ Steps for Better Thinking

Steps for Better Thinking (Turned Upside-Down)	Task Prompts That Address These Skills
Foundation: Knowledge and Skills (lowest cognitive complexity tasks) • repeat or paraphrase information from textbooks, notes, etc. • reason to single "correct" solution, perform computations, etc.	• Calculate _____. • Define _____. • Define in your own words _____. • List the elements of _____. • Describe _____. • List the pieces of information contained in _____ (specific narrative/paragraph/text). • Recite the arguments about _____ (assuming arguments are explicitly provided in textbook, notes, etc.)

Step 1: Identify the Problem, Relevant Information, and Uncertainties (low cognitive complexity tasks)
• identify problem and acknowledge reasons for enduring uncertainty and absence of single "correct" solution
• identify relevant information and uncertainties embedded in the information (may including "stacking up" relevant reasons and evidence to support some solution or conclusion)
	• Explain why people disagree about _____.
	• Explain why _____ can't be known with certainty.
	• Identify aspects of _____ in which uncertainty is a major factor.
	• Explain why even an expert about _____ can't predict with certainty what will happen when _____.
	• Create a list of information that might be useful in thinking about _____.
	• Consult experts and explore literature or other resources to:
	  • Create a list of issues related to _____.
	  • Create of list of different points of view related to _____.
	• Identify a range of possible solutions to _____.
	• Sort pieces of information to identify reasons and evidence that support a given solution to _____.

Step 2: Explore Interpretations and Connections (moderate cognitive complexity tasks)
• 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 to encompass problem complexities
	• Discuss the strengths and weaknesses of a particular piece of evi dence related to _____.
	• Interpret and discuss the quality of evidence related to _____.
	• Interpret and evaluate the quality of the same body of evidence related to _____ from different points of view.
	• Compare and contrast the arguments related to two or more solutions to _____.
	• Identify and discuss the implications of assumptians and preferences related to one or more points of view about _____.
	• Identify and discuss the implications of your own experiences and preferences for how you think about _____.
	• Develop one or more ways to organize information and analyses to help you think more thoroughly about _____.

Step 3: Prioritize Alternatives and Communicate Conclusions (high cognitive complexity tasks) • after thorough analysis, develop and use reasonable guidelines for prioritizing factors to consider and choosing among solutian options • communicate appropriately for a given audience and setting	• Prepare and defend a solution to _____. • Identify which issues you weighed more heavily than other issues in arriving at your conclusion about _____. • Explain how you prioritized issues in reaching a solution to _____. • Describe how the solution to _____ might change, given different priorities on important issues. • Explain how you would respond to arguments that support other reasonable solutions to _____. • Identify the most important information needs of the audience for communicating your recommendation about _____. • Explain how you designed your memo/presentation/_____ to effectively communicate to your audience. • Describe how you would communicate differently about _____ in different settings.
Step 4: Integrate, Monitor, and Refine Strategies for Re-addressing the Problem (highest cognitive complexity tasks) • acknowledge and explain limittions of endorsed solution • integrate skills in on-going process for generating and using informa - tion to monitor strategies and make reasonable modifications	• Describe the limitations of your proposed solutian to _____. • Explain the implications of limitatians to yaur proposed solution to _____. • Describe conditions under which you would reconsider your solution to _____. • Explain how conditions might change in the future, resulting in a possible change in the most reasonable solution to _____. • Develop strategies for generoting new information about _____. • Establish a plan for monitoring the performance of your recommended solution to _____. • Establish a plan for addressing the problem strategically over time.

- **Consider the curriculum-wide implications of student development.** To optimize performance, students need time and multiple opportunities to develop the thinking skills described in this paper. It is unrealistic to believe that experience in a single course can produce major changes in complex skills. Greater gains in student performance can be achieved if teachers work collaboratively within an educational program to support student development across the curriculum.

Conclusion

The skills outlined in Figure 1 are essential for operating effectively in our complex, rapidly changing, information-rich world—a world where information is fraught with substantial and enduring uncertainties that are not readily apparent. Developing effective problem solving skills that employ a solid knowledge foundation is a lifelong endeavor. When thinking skills are lacking, poor decision making and planning result. We can use what is known about how thinking skills develop to design assignments and learning environments that enhance thinking skills and increase the likelihood that our students will be able to address the open-ended problems they will face in their professional, personal, and civic roles.

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