7.

Teaching and Assessing the "Tools" for Thinking

Roland Case

In this chapter, I explain and defend an operational conception of critical thinking built around the metaphor of **intellectual resources** or "tools." This conception was developed in 1993 in collaboration with Jerrold Coombs, LeRoi Daniels, and Sharon Bailin (see Bailin, Coombs, and Daniels 1993, 1999).[1] We use the term "operational" to refer to the elements, or building blocks, that guide educators in embedding critical thinking into curriculum and instruction, not to an account of the concept or meaning of critical thinking.

In offering this account, I am cautioned by Carol Channing's wry comment when asked what she wanted for her birthday: "Don't give me a book," she quipped. "I've already got one." All of those reading this chapter already possess an **operational conception of critical thinking** — perhaps many have even developed their own. They may not want another. In light of this understandable reluctance to entertain yet another conception, I will begin by contrasting the dominant versions currently in play with our "tools" conception and suggest why this newer account is preferable. I will briefly explore the nature of these tools and conclude with their implications for classroom instruction and assessment.

Two Ways of Operationalizing Critical Thinking

Prevalent conceptions of critical thinking perceive it as a set of thinking competencies variously identified in terms of ambiguous notions such as abilities, skills, processes, procedures, or mental operations. Despite their differences, these approaches identify the "characteristics" of a critical thinker or the "elements," "aspects," or "dimensions" of critical thinking partly, if not exclusively, in terms of an identifiable list of tasks or functions that must be successfully completed. Marzano et al. (1988) identify eight thinking processes (including concept formation, problem-solving, decision-making, and research) involving twenty-one core thinking skills (including defining goals, setting goals, inferring, and predicting). Scholars within this tradition operationalize critical thinking in terms of constituent competencies — things that a critical thinker must be able to successfully carry out or accomplish.

There is not space here to articulate particular concerns about the various "constitutive competencies" approaches to critical thinking, especially because various authors use these terms differently and in overlapping ways. My colleagues and I have written about some of the epistemological confusions associated with many of these approaches (see Bailin, Coombs, and Daniels 1999). I want to focus on their lesser appreciated, pedagogical limitations.

Explicating critical thinking in terms of a finite list of "complex" competencies and dispositional traits typically leaves educators with inadequate or misleading advice about how to promote critical thinking. By definition, these conceptions tell us what a thinker should be able to do, and what he or she should be inclined to do, but not what developing these competencies and dispositions might require. Typically, the recommendations for teaching are general and predominantly methodological, educators are encouraged to engage students in a repeated practice of critical thinking "skills" across a variety of contexts.[2] However, this fails to tell teachers what they should teach students to develop these

abilities or successfully undertake these processes. Especially inadequate is advice on how to remediate the spotty "transfer" of these supposedly generalizable skills or processes. What, is needed is a variety of tools (e.g., varying strategies, criteria, and commitments) that are helpful in enhancing proficiency and in extending the domains within which a person can successfully draw inferences.

In addition, an emphasis on general abilities and skills is easily misconstrued in a way that creates the impression that critical thinking is about basic competencies rather than skillful analysis. Having the ability to play chess means little more than knowing the rules; it says little about the quality of play. As Blair points out in this volume, it is not basic abilities of this sort that are the aim of critical thinking. When educators read that thinking involves the "skill of analysis" they should understand this to mean that thinking requires "skillful analysis" and that the "ability to draw inferences" should mean much more than the capacity to do so. Unfortunately, these distinctions are commonly missed and educators adopt a "dumbed-down" version of critical thinking in which enabling resources are inadequately addressed.

These misrepresentations of the qualitative requirements of good thinking are evident in the tendency to distinguish "higher-order" and "lower-order" thinking. Properly understood, there is no direct or necessary connection between "higher-order" operations and critical thinking, and no necessary disjunction between "lower-order" operations and critical thinking. Whether or not students are thinking critically depends more on their intentions and the qualities that characterize their thinking as they carry out a task, than on the specific nature or type of mental operation. The mere fact that students are analyzing does not mean that they are doing it critically. If students blindly accept assumptions, leap to fallacious conclusions, and rely on inaccurate statements, one would be hard pressed to describe their "analysis" as exhibiting critical thinking. Conversely, the so-called "lower-order" operations, such as comprehending or remembering, need not consist of mere rote transfer of information but can be occasions for critical thinking.

Critical thinking is thus a way of undertaking any intellectual activity — by approaching it in a critically thoughtful manner. Success in the particular endeavour will depend on possessing the tools relevant to the task. We cannot teach students to be good analyzers or predictors, per se, but we can help them acquire the diverse intellectual resources needed to analyze or predict successfully in various contexts.

Accordingly, I want to unpack critical thinking in a way that identifies the varied intellectual resources or tools (the "**enabling resources**") that would assist or enable someone to successfully complete the range of tasks involved in thinking critically. Put another way, enabling resources refer to the knowledge and commitments that make it possible for someone to develop competence in the tasks that constitute good thinking. Enabling resources are not simply more specific sub-competencies (e.g., the ability to draw inferences can be sub-divided into the ability to infer deductively and inductively) but consist of the knowledge and affects which enable someone to successfully draw various kinds of inferences. In this respect, enabling resources are elemental, they cannot be divided into more basic elements.

As far as I am aware, the informal logic movement offers the only prevalent operational conception of critical thinking largely in terms of enabling resources (notably, in terms of principles and concepts). A major limitation of this account, recognized by its own proponents, is that informal logic addresses only a small part of the range of tools needed by critical thinkers (see Blair and Johnson 1991, 50).

There are, of course, widely accepted conceptions of critical thinking, such as those put forward by Robert Ennis (1996) and Mathew Lipman (1991), which are "hybrids" — that is, they delineate critical thinking partly in terms of enabling resources (notably criteria and strategies) and partly in terms of dispositions and competencies (sometimes dividing general competencies into more specific sub-competencies).[3] Naturally, the attention to enabling resources is welcomed. Unfortunately, only some competencies are unpacked in terms of enabling resources and,

even when they are, the enumerations rarely capture the full range of tools that competence in the specified task would require.

The "Tools" Conception in a Nutshell

In opposition to attempts to conceive of critical thinking as a limited set of constitutive competencies, I am suggesting an open-ended array of intellectual resources or tools that are drawn upon or employed by a critical thinker. Although the specific tools will depend on the nature of the challenge facing the thinker, promoting critical thinking is largely a matter of helping students master an ever broadening repertoire of five types of **intellectual resources**: background knowledge, criteria for judgment, critical thinking vocabulary, thinking strategies, and habits of mind. I briefly discuss each of these below

Background knowledge

Background knowledge is knowledge of the relevant information about a topic required for thoughtful reflection. Although it should, be obvious that one cannot think critically about a topic knowing little or nothing about it, many accounts of critical thinking fail to identify background knowledge as one of their building blocks. Instead, it is presumed that thinking skills or operations are independent of the content areas to which the skills are to be applied. Properly understood, relevant background knowledge is not separate from any skill, but part of what is required to be skilled.[4] Consequently, to be able to think critically about a range of topics, individuals need to acquire information relevant to those topics. This speaks strongly for embedding the teaching of critical thinking within the teaching of curricular content.

Criteria for judgment

Criteria for judgment are appropriate criteria or grounds for judging the reasonableness or merits of the options presented by a thinking challenge. To think critically is to engage in deliberations with the intention of making a reasoned judgment. And judgments inevitably are made on the basis of criteria. The root shared in common by "critical" thinking and "criteria" is instructive, thinking critically is thinking in light of or using criteria (Lipman 1988, 45). For this reason, an important category of tools is awareness of and concern for the relevant criteria for judgment. These criteria are far more numerous than the handful of intellectual standards suggested by Elder and Paul (2005). Rather they include a myriad of context-sensitive criteria spanning the diversity of intellectual tasks found in the curriculum, from what makes a good argumentative essay, a sound solution to a business problem, or a thoughtful question, to the qualities of a reliable scientific experiment, an accomplished artistic performance, or effective lecture notes.

Critical thinking vocabulary

"**Critical thinking vocabulary**" refers to concepts that expressly address distinctions foundational to thinking critically — for example, knowledge of the difference between "conclusion" and "premise," "cause" and "correlation," or "cause" and "effect," and knowledge of various informal fallacies. Theoretical and pedagogical attention to these concepts has been a key component of the informal logic movement.

Thinking strategies

Thinking strategies include procedures, heuristics, organizing devices, algorithms, and models that may be useful when thinking through a challenge. Good critical thinkers draw upon a large variety of strategies to work their way through the challenges

facing them. This category of tools is most closely aligned with what others call skills, although we believe they are better viewed as strategies. Looking for counter-arguments is a general strategy, yet it is not a broadly generalized skill (developing a persuasive counter-argument often requires contextual knowledge and situation-specific criteria). Thinking strategies may be very elaborate, such as following a comprehensive decision-making model (for example, when tackling a complex problem, begin by identifying the issue, then consider the consequences, research each option, and so on). Alternatively, they may be very focused strategies addressing a specific task (for example, to gain clarity about a statement rephrase it in your own words, ask others for clarification, or graphically represent the problem). There are literally thousands of strategies — in various forms (procedures, models, algorithms, graphic organizers, and other types of heuristics) — that guide individuals in working through the challenges they encounter.

Habits of mind

Although more commonly described as dispositions (as Giancarlo Gittens refers to them in this volume), we prefer the term "**habits of mind**" to refer to the intellectual ideals or virtues to which a careful and conscientious thinker will be committed. A commitment to these virtues orients and motivates thinkers in habitual ways that are conducive to good thinking. The characterization offered below is representative of the intellectual virtues important in thinking critically:

- *Initiative*: To think without prompting from others (not waiting to be told everything)
- *Inquisitiveness/ curiosity*: To explore matters and not take everything at face value
- *Critical-mindedness*: To evaluate information when it is important to do so

- *Open-mindedness*: To be open to views other than one's own, especially to contrary positions
- *Fair-mindedness*: To judge ideas on their merits and not simply enforce personal interests and biases
- *Independence of mind*: To resist pressures to adopt opinions merely because they are popular
- *Intellectual work ethic*: To persist in thinking through problems in a careful manner
- *Circumspection*: To be tentative in one's belief until there is sufficient evidence or complexity to warrant a more definitive position
- *Empathy*: To imagine sensitively the experiences and feelings of those in situations different from one's own and in different historical contexts
- *Tolerance of ambiguity*: To live with ambiguity and not require black-or-white answers
- *Self-reflection*: To ensure that one's beliefs and actions are well grounded
- *Respectfulness*: To engage respectfully in discussion with others
- *Humility*: To not take oneself too seriously (i.e., to be able to laugh at oneself)
- *Consultation*: To seek several sources of information, solicit expert opinion, and confer with others
- *Attentiveness to detail*: To take careful note of non-trivial particulars
- *Flexibility*: To alter tactics or approaches when needed

Significantly, there are "schools" of thinking that focus on each of the five kinds of tools that we identify. McPeck (1981) and Hirsch (1988) argue that sound thinking is best served by promoting student mastery of the subject matter of the disciplines. Perkins

and Salmon (1989), Siegel (1988), and Norris and Ennis (1989) believe that a central ingredient of good thinking is thinking dispositions, which are closely related to what we have called "habits of mind." Lipman (1991) and Paul (1988) are prominent advocates of the centrality of criteria for judgment (also called intellectual standards). The informal logic school of thinking stresses two categories of tools: those criteria for judgment reflected in the formal and informal rules of logic (e.g., the rules of class, conditional, and probabilistic reasoning) and what we call "critical thinking vocabulary." The final category of tools — thinking strategies — is arguably the most widely espoused dimension of critical thinking. Much of the literature on promoting thinking skills is a matter of teaching strategies for carrying out various operations.[5] The existence of these different camps suggests that our five categories of tools represent a more complete synthesis of the range of critical thinking building blocks than is found in any single account.

Teaching and Assessing the Tools

I now want to turn more directly to how critical thinking, understood as I have conceptualized it, can be taught and assessed. It should be obvious that nurturing critical thinking is a *long-term evolutionary goal* — critical thinking proficiency develops gradually as individuals acquire and enrich a vast repertoire of intellectual tools. Consequently, promoting critical thinking requires incremental, collective effort — no single course can do it. Our efforts are, as Tyler (1969) suggests, like dripping water on a stone: "In a day or week or a month there is no appreciable change in the stone, but over a period of years definite erosion is noted. Correspondingly, by the cumulation of educational experiences profound changes are brought about in the learner" (83). Clearly, educators must take the long view when nurturing critical thinking: it is a kindergarten-to-university challenge.

Tools must be developed and assessed in realistic or meaningful contexts because the context determines the tools that are needed.[6]

The choice of contexts and the range of tools to be taught and assessed will depend on the kinds of tasks that we want students to be able to do. There is no generic skill of inferring to be exercised. Rather, there is a desirable range of contexts for drawing inferences in history, biology, geometry, literature, and other subject areas. Students will need to acquire the requisite tools to meet these challenges. Embedding critical thinking in the teaching of curriculum content means that students are more likely to acquire the subject matter that they are supposed to learn and that critical thinking is more likely to be an ongoing classroom activity.[7]

The pedagogical value of conceiving of critical thinking as the competent use of contextually relevant tools is best seen through examples of teachers attempting to help their students work through particular critical thinking challenges. An important function of the tools approach is to help teachers identify what students need to be taught to enable them to undertake a given task in a critically thoughtful manner. To illustrate the instructional value of our model, I discuss two examples of teaching students the tools needed to ask effective questions. I begin with teaching primary students to think critically about developing "powerful" questions.

Developing powerful questions[8]

As part of their social studies curriculum, Tami McDiarmid's kindergarten to grade three class was to learn about the significance of Remembrance Day (November 11). In fostering appreciation of this event, Tami invited her students to think of questions they might ask of a classroom guest who was to speak about his World War II experiences. Left to their own devices, many students would likely have asked rather trivial or irrelevant questions. Tami sought to support her students in thinking critically about the questions they might ask by focusing their attention on four tools: some critical thinking vocabulary, criteria for judgment, a thinking strategy, and background knowledge.

A few days prior to the visit, Tami re-introduced key vocabulary by reminding her students that they had previously talked about two kinds of questions: “weak” questions and “powerful” questions. Armed with this distinction, the class discussed what powerful questions “look like or sound like”— or, to use our terminology, they discussed the criteria for judging powerful questions. Tami recorded the following student-generated criteria.

Powerful Questions:

- give you lots of information
- are specific to the person or situation
- are open-ended — can’t be answered by yes or no
- may be unexpected
- are usually not easy to answer (McDiarmid, Manzo, and Musselle, 2007, 115-9)

Next, Tami made use of a thinking strategy — brainstorming — that her students had already learned to use. Brainstorming is a useful strategy to help with the generation of ideas. In itself, it does not invoke critical thinking. In fact, while brainstorming, individuals are discouraged from making judgments about the proffered ideas — the point is simply to generate as many ideas as possible. The critical thinking began in earnest when students, working in pairs, began to assess the brainstormed questions. Using the agreed-upon criteria as their guide, students discussed whether or not their proposed questions were likely to elicit a lot of information, were obvious or predictable, and so on. Some “weak” questions were rejected, others were modified to make them more powerful.

Tami had developed a fourth tool — relevant background knowledge — during the three, weeks preceding the guest’s visit by reading and discussing various children’s stories involving the war. Without the knowledge acquired from these stories, many students would have been incapable of asking a thoughtful

question. Here is a sampling of the student-generated questions asked of the World War II veteran:

- Why did you fight in the war?
- Do you remember some of your friends from the war?
- Which countries did you fight over?
- Where did you live during the war?
- Were there any women in World War II? If so, what were their jobs?
- What started the fighting?
- Why was Canada involved?
- What was your safe place? (McDiarmid, Manzo, and Musselle, 2007, 117)

Tami systematically aided her primary students in thoughtfully constructing questions by teaching four tools. Notice, teaching the tools is not the same as giving students the answers or doing the thinking for them. Tami did not indicate to students the questions they might ask; rather she helped them develop the intellectual resources they needed to thoughtfully complete the task for themselves. Not only were these students able to pose powerful questions aided by the tools their teacher helped them acquire, but their understanding of the subject matter — in this case the significance of Remembrance Day — was enhanced by the experience.

We can appreciate the contextual nature of teaching the tools and, by implication, the limitations of generic thinking models, by, contrasting the tools Tami developed with those developed by a junior high school teacher as she helped students think critically about questions for an end-of-unit test in social studies.

Developing examination questions[9]

Karen Barnett, a junior high school humanities teacher, borrowing an idea from fellow teacher Bob Friend, had her students create, rather than simply answer, exam questions. Their task was to prepare an end-of-unit quiz consisting of six questions and an answer key focused on their study of seventeenth-century England. In supporting her students in this task, Karen provided three tools: background knowledge, criteria for judgment, and a thinking strategy.

The required background knowledge — knowledge of the focus of questions — was acquired by reading the relevant chapter in their textbook and by undertaking a variety of related assignments. When framing their six questions, students were instructed to consider four criteria:

- must be clear so that fellow students will understand what is required;
- should address a non-trivial aspect of the chapter content;
- can be answered within a half page (or twenty minutes); and
- must require more than mere recall of information.

Karen further supported her students' efforts by offering a thinking strategy — the use of "question frames" — to help generate questions that went beyond mere recall of information. More specifically, students were invited to frame questions using prompts such as the following:

- Compare… with…
- What conclusion can be drawn from…?
- Decide if… was correct when…
- Predict what would have happened if…
- What was the effect of…?

- Decide which choice you would make if…

A list of the best student-generated questions was distributed to the class well before the test. Students were informed that their test would be drawn exclusively from their questions. The following questions were submitted by one of the students in Karen's class:

1. Compare the ideas of Thomas Hobbes and John Locke on government.
2. Do you think Cromwell was correct in chopping off the king's head, and what advantage did government gain over royalty because of this?
3. What were the effects of the civil war on the monarchy and the peasantry of the country?
4. If you were the king, how would you handle the pressures of government and the people?
5. Compare the power of the government in the early 1600s to the power it has today. What do you think would have happened if the people hadn't rebelled against the king?

We can see the contextual nature of the tools involved in posing effective questions by contrasting the two situations. The required background knowledge in one case was knowledge of World War II; in the other, it was knowledge of the civil war period in seventeenth-century England. Karen's sample "question frames" offered a thinking strategy — a complementary strategy to brainstorming — to help students generate questions. Karen's articulation of the criteria — different from the criteria offered in the primary class — focused students' thinking on the features of good examination questions.

Significantly, teaching students to think critically about the questions they posed contributed to their understanding of the subject matter. The criteria that Karen set — notably that students ask non-trivial questions — required students to think about what was important about the historical period. So, too, did her inclusion

of student-generated questions on the unit test. Because these questions went beyond mere recall of information, studying for the test required that other students think about the issues raised. Karen insists that, had she posed the very questions her students had produced, she would have been bombarded with complaints: “How do you expect us to know this? You never told us the answers to this!” Instead, not only did students take seriously the assignment to create the questions — in some cases reading the textbook for the first time — they were more motivated to study for the test because the questions were posed by their peers.

The motivational value of critical thinking is important. Although not all students will welcome opportunities to think critically, more often than not, students would rather think about matters than regurgitate facts or apply undigested ideas. This is especially true when the issues or topics about which students are asked to think critically are meaningful to them.

Assessing the Tools

Another useful feature of the tools approach is the parallel between instruction and assessment. Assessment is a major obstacle for many teachers in their efforts to promote critical thinking. If there is no single correct answer to look for in student responses, it is often difficult to know what to assess. As our last two examples illustrate, students can still fully construct a large number of effective questions. Does this mean that virtually any question is acceptable? If not, on what basis should these questions be assessed?

The topic of assessment of critical thinking deserves more space than is available here. Let me say simply that the key consideration is not whether teachers agree or disagree with the conclusions students reach but rather the quality of the thinking that supports their answers. In assessing critical thinking, teachers should look for evidence that students’ answers competently embody the relevant tools. It may be unrealistic to assess students on the complete range of tools that a particular task requires. A more

appropriate or valid approach is to assess only those tools that students were expected and instructed to employ in the task before them. Returning to the two examples of teaching students to pose effective questions will permit us to see what this looks like in practice.

Assessing thinking about powerful questions

In learning to pose powerful questions to the war veteran, Tami's students were expressly taught four tools, all of which might form the basis for assessing students' thinking. The actual questions could be evaluated on two criteria:[10] the criteria for judgment and background knowledge about World War II. The former could be assessed by looking to see how well the question each student posed met the agreed upon criteria. (Alternatively, students might be asked to explain how their question satisfied each criterion.) Students' questions could be used to assess background knowledge by looking to see whether any question revealed factual errors. The teacher could circulate among the groups and assess their use of the brainstorming strategy by observing whether students readily volunteered questions and accepted all suggestions. Students' understanding of the conceptual distinction between weak and powerful questions could then be assessed by providing sample questions and asking students to identify which of them were weak, which of them were powerful, and why.

Assessing thinking about test questions

In the second example, Karen's students were provided with three tools to support their thinking about examination questions: a range of criteria for effective test questions, the "question frame" strategy for generating questions, and background knowledge on the historical period. The student-generated questions could be assessed on all three grounds: how well they satisfied the stipulated criteria for judgment, the extent to which the questions represented a variety of question frames and, to a lesser extent,

how much knowledge of the period was implied by the questions asked. (A more appropriate source for assessing students' background knowledge would be the answer key that was to accompany each student's six questions.)

Because the focus of the second example was on posing test questions, no mention was made of the tools needed to help students think critically about their answer keys (and, by implication, about their answers on the actual end-of-unit quiz). It would be instructive to consider briefly what these tools might be. Obviously, there is no definitive list of tools for teaching students to answer exam questions thoughtfully. Often, the identified tools depend on the teacher's *priori* ties for the assignment, the perceived needs of the students, and the demands of the curriculum. Still, I think that there will be considerable agreement on the sorts of tools that teachers would recognize as being appropriate. A useful place to begin thinking about which tools to assess is to imagine a weak student's response to a sample question (poor responses are often more revealing than good ones). Consider the question, "What do you think would have happened if the people hadn't rebelled against the king?", and the following obviously flawed answer: "If the people hadn't rebelled they would have quickly forgotten their troubles and gone back to watching television." What relevant tools appear to be absent in this answer? The historical error of assuming the existence of television in the seventeenth century comes immediately to mind. Or, to put it in our terminology, the background knowledge is incomplete. The bald assertion that the citizenry would quickly forget their problems is vague, somewhat implausible, and not supported by any evidence. These deficits suggest gaps in understanding the criteria for judging a thoughtful response.

The historical error about watching television might suggest stressing the need for students to read the relevant chapter of the text carefully. In addressing the gaps in criteria for judgment, the teacher might explore with students the importance of a detailed (or specific) answer, that it be plausible and amply supported by evidence (or reasons). The specification of these three criteria for judgment might raise the need to teach critical thinking

vocabulary, all students might not know the difference between *plausible* and *actual* outcomes. (An outcome need not be actual, or even likely, for it to be plausible.) The teacher might also try to nurture an *empathic* habit of mind. Empathy, in this particular case historical empathy, involves an appreciation of how others in different situations and contexts might feel about an event. If students were inclined to put themselves, metaphorically speaking, into the heads and hearts of those living in the seventeenth century, their answers to the questions might be more detailed and plausible. In casting about for thinking strategies to help students construct a thoughtful answer, teachers might recommend a "template" for their answers. For example, students might employ a three-point outline: (1) Briefly summarize the position taken; (2) Elaborate on what is meant or implied by the position; and (3) Offer several pieces of evidence to justify the position.

Imagining other hypothetical student answers, including ideal answers, might help to elaborate upon and refine the list of requisite tools. For example, the imagined exemplary answers might include refutation of possible objections to the stated position (attending to what Johnson, in this volume, calls "dialectical obligations"). Or, answers may include suggested alternative positions and evaluations of the relative merits of each (what Sobocan, in this volume, might consider to be a creative, critical response). If these are thought to be reasonable and appropriate expectations, additional tools might be introduced, including teaching the concepts of *argument* and *counter-argument* and revising the suggested three-point outline to add a new step: (4) Anticipate possible objections to the position and provide a counter-argument for each. Needless to say, there are other possible tools for teaching and, in turn, assessment. The point to appreciate is how varied the tools and much better students' answers will likely be if they have been taught to apply some of these tools to textbook and classroom learning.

I have attempted to make a case on conceptual and pedagogical grounds against framing critical thinking in terms of a finite set of generalized competencies and dispositions. In its place, I have argued for recognizing a substantial repertoire of five types of

intellectual tools, nurtured incrementally in the context of a wide spectrum of curriculum-embedded thinking challenges. We believe this approach does justice to the challenges inherent in promoting critical thinking while enhancing the development of other educational goals.

References

Bailin, S., J. Coombs, and L. Daniels. 1999. Conceptualizing critical thinking, *Journal of Curriculum Studies* 31(3): 285-302.

____. 1993. (September). *A conception of critical thinking for curriculum, instruction and assessment*. Victoria, BC: Examinations Branch, Ministry of Education.

Blair, J., and R. Johnson. 1991. Misconceptions of informal logic: A reply to McPeck. *Teaching Philosophy* 14(1): 35-52.

Elder, L., and R. Paul. 2005. *Universal intellectual standards*. Online. Available from http://www.criticalthinking.org/page.cfm?PageID=S27& categoryID=68. Last accessed October 24,2007.

Ennis, R. 1996. *Critical thinking*. Upper Saddle River, NJ: Prentice Hall.

Hirsch, E. 1988. *Cultural literacy: What every American needs to know*. New York: Vintage Books.

Lipman, M. 1991. *Thinking in education*. Cambridge: Cambridge University Press.

____. 1988. *Critical thinking: What can it be?* Educational Leadership 45: 38-43.

Marzano, R., R. Brandt, C. Hughes, B. Jones, B. Presseisen, S. Rankin, and C. Suhor. 1988. *Dimensions of thinking: A framework for curriculum and instruction*. Alexandria, VA: Association for Supervision and Curriculum Development.

McDiarmid, T., R. Manzo, and T. Musselle. 2007. *Critical challenges for primary students*. Vancouver, BC: The Critical Thinking Consortium.

McPeck, J. 1981. *Critical thinking and education*. Oxford: Martin Robertson.

Norris, S., and R. Ennis. 1989. *Evaluating critical thinking*. Pacific Grove, CA: Midwest Publications.

Paul, R. 1988. *What, then, is critical thinking?* Rohnert Park, CA: Center for Critical Thinking and Moral Critique.

Perkins, D., and G. Salmon. 1989. Are cognitive skills context-bound? *Educational Researcher* 18(1): 1-21.

Raths, L., S. Wassermann, A. Jonas, and A. Arnold. 1986. *Teaching for thinking: Theory, strategies, and activities for the classroom*. New York: Teachers College Press.

Siegel, H. 1988. *Educating reason: Rationality, critical thinking, and education*. New York: Routledge.

Tyler, R. 1969. *Basic principles of curriculum and instruction*. Chicago: University of Chicago Press.

Notes

1. When I use the word "we" in this chapter I am referring to Jerrold Coombs, LeRoi Daniels, Sharon Bailin, and myself, unless the context suggests another obvious meaning.
2. Raths et al. (1986) unequivocally state, "Here, then, is the first principle upon which a teaching for thinking program is based: *Children need to spend many, many hours practicing higher-order thinking skills if they are to become successful thinkers*" (xiv [emphasis in original]).
3. Most of what Robert Ennis calls critical thinking abilities are constitutive tasks. Many elements of these abilities are simply more specific abilities. (such as designing experiments, interpretation of statements) but others identify what I refer to as enabling resources — largely thinking strategies and criteria (see Norris and Ennis 1989, 183-7). Lipman (1991, 22' includes criteria, thinking strategies, and cognitive skills. Other writers identify some of the tools I will discuss.
4. Consider the example of teaching students the so-called operation of analysis. We cannot effectively teach students *the* process or skill of analyzing for the simple reason that analysis of, say, a poem for its metre, rhyme, and symbolism poses a significantly different challenge than that posed by the analysis of an ore sample for its chemical properties.
5. The close connection between many researchers' conception of "skills" and strategies are evident in the statement that "philosophers have a general skill: the strategy of looking for counterexamples to test claims" (Perkins and Salmon 1989, 19).
6. Although I focus on the curricular contexts for teaching the tools, critical

thinking cannot be learned independently of the broader forces operating within the classroom and the school. Consequently, it is essential to foster "critical" communities where teachers and students interact in mutually supportive ways to nurture critical reflection. This is especially significant for acquisition of the desired habits of mind which are likely to develop only if they are modelled and continuously supported. Building a community of thinkers is also instrumental in countering a tendency to view thinking as a solitary enterprise. There is a key difference between thinking for *one's self* and thinking *by oneself.* Good critical thinkers regularly engage in dialogue with others as a way of broadening their knowledge, testing their ideas, and securing alternative perspectives. Learning to contribute to and to make use of the wisdom of others can be learned only through participation in a critical community.

7. Curriculum resources developed by The Critical Thinking Consortium that teach subject matter through critical thinking can be found at http://www.tcz.ca.
8. This example is based on a lesson described in McDiarmid, Manzo, and Musselle (2007).
9. Based on a personal communication with Karen Barnett.
10. Notice my use of criteria in two contexts: I talk about *assessment criteria* and *criteria for judgment*. Assessment criteria are the grounds for assessing a student's work and, in the area of critical thinking, we recommend using all five tools as sources of assessment criteria. This implies that the tools we refer to as "criteria for judgment" are but one of the ways to assess critical thinking.