Critical thinking as an educational ideal

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Abstract: Critical thinking arrives at a judgment on a question by looking back in a reasonable way at the relevant evidence; it is "reasonable reflective thinking focused on deciding what to believe or do" (Ennis). Its key component skills are those of clarifying meaning, analyzing arguments, evaluating evidence, judging whether a conclusion follows, and drawing warranted conclusions. An ideal "critical thinker" is open-minded and fair-minded, searches for evidence, tries to be well-informed, is attentive to others' views and their reasons, proportions belief to the evidence, and is willing to consider alternatives and revise beliefs. The process of thinking critically involves problem identification and analysis, clarification of meaning, gathering the evidence, assessing the evidence, inferring conclusions, considering other relevant information, and making an overall judgment. Critical thinking differs from the logical appraisal of arguments in extending beyond a single argument, having a creative component, and involving critical assessment of evidence. Any educational system should aim to teach the knowledge, develop the skills, and foster the attitudes and dispositions of a critical thinker: someone who thinks critically when it is appropriate to do so, and who does so well. It can do so either by infusion in subject-matter courses or through a stand-alone course. Each method has advantages and disadvantages; a combination is theoretically better, but hard to achieve. In a stand-alone course, one should adapt to one's situation, communicate the course goals, motivate one's students, use a checklist as a course framework, foster a critical spirit, prefer depth to breadth, use bridging, take advantage of salient issues, use real or realistic examples, pick one's examples with care, give students lots of guided practice with feedback, check for understanding, encourage meta-cognition, think about context, watch for empty use of technical terms, and design multiple-choice items carefully if one uses them.

The following remarks about critical thinking as an educational ideal incorporate and adapt material from chapter 4 of the book *Evidence-Based Practice: Logic and Critical Thinking in Medicine*, co-authored by Milos Jenicek, MD, and myself, and published in 2005 by American Medical Association (AMA) Press (Jenicek & Hitchcock 2005). I acknowledge with thanks the permission of AMA Press to use this material.

1. Historical development of the concept of critical thinking

1.1 John Dewey

The concept of critical thinking was first singled out just 100 years ago, by the American philosopher, John Dewey. In a book entitled *How We Think*, first published in 1910, Dewey presented what he called "reflective thinking" as an

> active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends (Dewey 1910, p. 6).

For Dewey, such thinking arises in response to a suggested resolution of some specifically occasioned perplexity:

> If the suggestion that occurs is at once accepted, we have uncritical thinking, the minimum of reflection. To turn the thing over in mind, to reflect, means to hunt for additional evidence, for new data, that will develop the suggestion, and will either, as we say, bear it out or make obvious its absurdity and irrelevance. . . Reflective thinking, in short, means judgment suspended during further inquiry. . . (p. 13)

In essence, Dewey's reflective thinking is the systematic testing of hypotheses, i.e. what is sometimes called the scientific method. Reflective thinking in Dewey's original sense begins with the definition of a problem, often a problem of understanding why a certain phenomenon occurs. One or more hypotheses are proposed as possible solutions. Then some method of systematic observation or experiment is devised as a test of these hypotheses, and carried out. The results of this investigation are analyzed, qualitatively or quantitatively, and interpreted. Tentative conclusions may be reached, but are subject to testing by further experiments. Thus the primary focus of reflective or critical thinking in Dewey's sense is the consideration of hypotheses suggested as possible solutions to perplexities people face. What many people now identify as critical thinking--the scrutiny of arguments and assertions produced by others--is at best a minor part of reflective thinking thus conceived, an activity hardly mentioned in Dewey's book.

1.2 Edward Glaser

Inspired by Dewey, the Progressive Education Association in the United States promoted over the next 40 years what they called "critical thinking", a criterion used in

the Association's landmark Eight-Year Study in the 1930's. Another outgrowth of the progressive education emphasis on critical thinking was the pioneering development by Goodwin Watson and Edward Glaser, starting in 1925, of the Watson-Glaser Critical Thinking Appraisal, a version of which lives on today as the Watson-Glaser II Critical Thinking Appraisal (Watson & Glaser 2009).

Glaser (1941) characterized "critical thinking" as including:

an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experience; knowledge of the methods of logical inquiry and reasoning; and some skill in applying these methods. Critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends.

The last-quoted sentence uses almost the same words as Dewey's definition of "reflective thinking". Glaser specified this basic conception with a list of abilities, including those involved in systematic problem-solving. A guide to teaching critical thinking in the social studies published the following year likewise identified the components of critical thinking in terms of the elements of problem-solving.

1.3 1940s through 1960s

The first introductory textbook with the word "critical thinking" in its title appeared in 1946 (Black 1946); its subtitle was "an introduction to logic and scientific method".

About a decade later, B. Othanel Smith (1953) gave the concept of critical thinking an appraisal-only sense somewhat more limited than Glaser's conception:

Now if we set about to find out what . . . [a] statement means and to determine whether to accept or reject it, we would be engaged in thinking which, for lack of a better term, we shall call critical thinking.

Influenced by this conception, Robert Ennis (1962) defined critical thinking in a landmark paper as "the correct assessing of statements". Ennis identified 12 aspects of this activity and gave criteria for their correct performance. In keeping with the linguistic focus of much of the Anglo-American philosophy of the time, Smith and Ennis reformulated as statements the "belief or supposed form of knowledge" which Dewey and Glaser took to be the starting-point of reflective or critical thinking.

1.4 1970s and 1980s

In North America, the 1970s and 1980s saw an explosion of educational interest in critical thinking, including a mushrooming of college and university courses in "informal logic" or "reasoning", which were conceived as alternatives to introductory symbolic logic courses. With this explosion of interest came new conceptualizations of critical thinking:

- the appropriate use of reflective scepticism within the problem area under consideration (McPeck 1981).
- using the standards of reason in deciding what to believe and what to do (Hitchcock 1983).
- reasonable and reflective thinking that is focused on deciding what to believe or do (Ennis 1985, 1996).
- skillful, responsible thinking that facilitates good judgment because it
  - relies upon criteria,
  - is self-correcting and
  - is sensitive to context (Lipman 1988).
- thinking (and acting) which is appropriately moved by reasons (Siegel 1988).
- disciplined, self-directed thinking that exemplifies the perfection of thinking appropriate to a particular mode or domain of thinking (Paul 1989, 1993).

None of these conceptions is an appraisal-only sense of critical thinking. In particular, Ennis has abandoned his earlier restriction to appraisal, partly to reflect the way the term 'critical thinking' is used, partly because the skills involved in correctly assessing statements overlap extensively with those involved in deciding reasonably and reflectively what to believe or do. Another change in the 1980s was increased attention to the attitudes and dispositions of a critical thinker; previous conceptions had focused almost exclusively on skills.

1.5 The 1990 statement of expert consensus

In 1990 Peter Facione presented to the Committee on Pre-College Philosophy of the American Philosophical Association a statement of expert consensus on critical thinking for the purposes of educational assessment and instruction (Facione 1990). This report was the fruit of a two-year Delphi process involving 46 experts in critical thinking,

including psychologists and educational researchers as well as philosophers. They agreed to characterize critical thinking as:

> purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based*. . .* (Facione 1990, p. 3)

The report specified the core skills and sub-skills constitutive of the kind of judgment described in this general characterization. It added a list of mental habits of the "ideal critical thinker" (such as being inquisitive, open-minded, orderly, focused and persistent) that has much in common with Ennis' list (1985, 1991) of the dispositions of the ideal critical thinker. Like the definitions from the 1980s quoted above, the experts' consensus eschews an appraisal-only sense of critical thinking. Indeed, it includes among critical thinking skills categorizing situations, decoding graphs and paraphrasing statements, as well as the more familiar skills of devising testing strategies, formulating alternative solutions or hypotheses, judging the acceptability of premises and inferences, and drawing conclusions.

1.6 Fisher and Scriven

More recently Alec Fisher and Michael Scriven have devoted an entire monograph to the definition and assessment of critical thinking. They define critical thinking as the "skilled and active interpretation and evaluation of observations, communications, information and argumentation" (Fisher & Scriven 1997, p. 21). The assessment of critical thinking was the subject of an earlier monograph by Stephen Norris and Ennis (1989).

2. The definition of critical thinking

What are we to make of this confusing sequence of apparently competing definitions? First, we should not be surprised by the apparent absence of consensus. New domains are normally the subject of numerous definitions before a broad consensus is reached.

2.1 Commonalities and differences among rival definitions

Second, amid the variety, we can detect considerable commonality:

- Critical thinking is a type of thinking.
- It applies to all subject matters.

- It involves reflection, looking back, suspending judgment.
- Good critical thinking is reasonable.
- Critical thinking involves a careful consideration of evidence.
- Critical thinking is oriented towards making a definite judgment.
- The ideal "critical thinker" thinks critically whenever it is appropriate.
- Being a critical thinker involves knowledge, skills, attitudes, and dispositions (behavioral tendencies).

We can also detect certain key differences:

- Some conceptions (Dewey 1910, Glaser 1941, Smith 1953, Ennis 1962, Hitchcock 1983, Fisher & Scriven 1997) treat critical thinking as concerned only with the appraisal of already existing intellectual products (such as hypotheses, statements, and arguments), whereas others (Ennis 1985, 1987, 1991; Paul 1989, 1993) treat it more generally as applying also to the creation of intellectual products (such as solutions to problems, explanations of perplexing phenomena, decisions in complex situations, and answers to difficult questions).
- Some conceptions (Glaser 1941, Ennis 1962, Hitchcock 1983) focus on skills, others (Paul 1982, 1993) emphasize attitudes, still others (Ennis 1985, 1987, 1991, 1996; Siegel 1988) emphasize both.
- Some conceptions (Glaser 1941; Ennis 1962, 1987, 1996; Paul 1993) treat at least some aspects of critical thinking as highly general, whereas others (McPeck 1981) treat critical thinking as necessarily subject-specific.

There are also differences about the role and importance of deduction in critical thinking, about the tolerance of imprecision, and about the relationship between critical thinking and the logical analysis of arguments.

2.2 Component skills and attitudes

Third, the important thing is not the general definition, but the specification of standards. Hence, it is more useful to look beyond the definitions to descriptions of critical thinking skills and of the attitudes and behavioral tendencies of a "critical thinker". The most developed conceptions of the component skills of critical thinking have been advanced by Glaser (1941), Ennis (1987), Facione (1990), Fisher (2001), and Fisher and Scriven

(1997). Ennis (1962, 1987) and Facione (1990) have provided elaborate descriptions of sub-skills. Despite differences, their lists have in common the following component skills of critical thinking:

- Clarify meaning
- Analyze arguments
- Evaluate evidence
- Judge whether a conclusion follows
- Draw warranted conclusions

A critical thinker not only possesses critical thinking skills but also exercises them when (and only when) it is appropriate to do so. Such tendencies are called dispositions, and they are reflected in a person's mental attitudes. The most developed published conceptions of the dispositional and attitudinal components of a critical thinker have been advanced by Glaser (1941), Ennis (1996), and Facione (1990). Their lists have in common the following dispositional and attitudinal characteristics of a critical thinker:

- Open-minded
- Fair-minded
- Searching for evidence
- Trying to be well-informed
- Attentive to others' views and their reasons
- Proportioning belief to the evidence
- Willing to consider alternatives and revise beliefs

2.3 Assessment: criteria and standards

A list of component skills and attitudes is not yet a set of standards. There must be criteria for the possession of each skill or attitude and standards for meeting each criterion in a satisfactory way. Of the authors just mentioned, only Ennis (1962) has produced even criteria, let alone standards. But Watson and Glaser (2009), Ennis, and Milman (2005) and Facione (1998, 2000) have produced standardized tests of critical thinking skills which implicitly provide criteria. And Fisher has developed an examination in critical thinking which thousands of secondary school students take in the United Kingdom each year (Oxford, Cambridge and RSA Examinations 2011); his monograph

(Fisher 2001) serves as a textbook for the course leading to this examination. Each of the standardized tests has norms derived from previous administrations of the test, which can be used as the basis for at least comparative standards. The four tests use multiple-choice items to test the following skills (the number in parentheses being the number of tests with such items):

- evaluation of inferences from given statements to a given conclusion (4)
- identification of an assumption implicit in a given statement or argument (4)
- clarification of meaning (3)
- evaluation of the credibility of a statement (2)
- analysis of the structure of argumentation in a passage (2)
- evaluation of what follows from given information (1)
- judgment of how to evaluate a given claim (1)
- identification of fallacies (1).

Of the four tests, the Cornell Critical Thinking Test Level Z is the most comprehensive. The GCE in Critical Thinking differs from the other three tests in having a written component. It focuses on evaluating reasoning of different kinds and on presenting arguments.

2.4 Relation to the logical analysis of arguments

Is critical thinking synonymous with the logical analysis of arguments? The logical analysis of arguments certainly covers many core critical thinking skills. But critical thinking skills go beyond logical analysis to include such things as the evaluation of evidence and searching for additional information. In this respect, critical thinking is broader than the logical analysis of arguments. On the other hand, critical thinking comes into play only with "judgment suspended during further inquiry", to quote Dewey's original formulation. Much reasoning and argument is routine; an example is working out a simple problem in arithmetic or algebra. In a field of expertise like medicine or law or accounting, critical thinking occurs only occasionally, for example, when a physician has to make a differential diagnosis or a lawyer tries to make sense of conflicting precedents similar to a case under review. Also, critical thinking typically involves consideration of many arguments, whereas logical analysis applies to single arguments. Hence, if we were to make an Euler diagram of logical reasoning and

argument on the one hand, and critical thinking on the other, the two circles would overlap. Some, but not all, logical analysis of argument is critical thinking. And some critical thinking, but not all, is logical analysis of argument.

In thinking critically, we not only want to find out if a single piece of reasoning or argument is good or bad. We also want to know more about its context and see it in a broader framework of alternative choices, ways or options. We want to trace the best path towards our understanding of a problem and make the best decision about it. We also look at the extent to which all our judgments and decisions are supported by evidence while examining as well the quality of this evidence.

The key to developing critical thinking skills and dispositions is to become aware of how we think and to work consciously at improving our thinking with reference to some model. This conscious drive to improve involves an overall assessment of our own thinking, a 'thinking about our own thinking', commonly known as meta-cognition (Fisher 2001). In minimal meta-cognition, one is aware that one is engaging in a certain kind of thinking, such as judging whether a reported correlation supports a causal claim. An advanced form of meta-cognition organizes the thinking by consciously engaging in a strategy, such as considering alternative explanations in terms of a third causal factor, reverse causation or coincidence. Meta-cognition is at its most reflective when one reflects upon the way one is thinking and considers how to improve it. (Swartz & Perkins 1990, p. 52)

2.5 The process of thinking critically

A list of skills and attitudes, even if accompanied by criteria and standards for their attainment, gives little guidance on how to deploy the skills and attitudes included in the list when one thinks critically about a particular problem, hypothesis or argument. For this purpose, a checklist provides a helpful framework. Such checklists can be found in some writings about critical thinking, for example Hitchcock (1983), Ennis (1996) and Jenicek and Hitchcock (2005). Hitchcock (1983) uses the acronym OMSITOG to summarize a seven-component model:

1. Get an **O**VERVIEW of the message.
2. Clarify **M**EANING.
3. Portray **S**TRUCTURE of argumentation, if any.

4. Check whether **I**NFERENCES are sound.

5. Evaluate the **T**RUTH of claims not supported by argument (assess the evidence on which conclusions are based).

6. Consider **O**THER relevant evidence and arguments.

7. **G**RADE the message.

Ennis (1996) uses the acronym FRISCO for his six-component model:

1. Identify the FOCUS: the main point or main problem.

2. Identify and evaluate the relevant REASONS.

3. Judge the INFERENCES.

4. Attend to the SITUATION: aspects of the setting, which provide meaning and rules.

5. Obtain and maintain CLARITY in what is said.

6. Make an OVERVIEW of what you have discovered, decided, considered, learned and inferred.

Jenicek and Hitchcock (2005) identify seven components of the critical thinking process, which they describe as a form of problem-solving:

1. Problem identification and analysis: The problem (the main question or the main point) is identified and if necessary broken up into component parts.

2. Clarification of meaning: The meaning of terms, phrases and sentences is clarified where necessary. This component includes clarification of the problem to see how it should be investigated, as well as operationalization of key terms in an investigation.

3. Gathering the evidence: Evidence relevant to the problem is obtained.

4. Assessing the evidence: The quality of the evidence is judged.

5. Inferring conclusions: Conclusions are drawn from the best evidence, or inferences drawn by others are evaluated.

6. Other relevant information is considered: possible exception-making circumstances, situational factors, implications of one's tentative conclusions, alternative positions and their justification, alternative explanations of results, possible objections and criticisms, etc.

7.   Overall judgment: Some sort of overall judgment on the problem is reached, taking into account all the components of the critical thinking process.

These seven components and related questions, which Fisher (2001) termed a 'thinking map', should be regarded as a checklist rather than a sequence. A given critical thinking process can jump around from one point on the checklist to another, and back again. For example, it may be necessary to clarify meaning at more than one stage of the process.

Let us look in detail at the seven components of the critical thinking process identified by Jenicek and Hitchcock.

In problem identification and analysis, we identify the central focus of our critical thinking. It may be a problem or question, either open-ended or restricted to specified alternatives. It may be a hypothesis suggested as an explanation of some phenomenon. It may be the main conclusion of an array of connected arguments.

Sometimes, a problem is so vast that it needs to be 'atomized', broken into component parts that can be separately treated. Such an analysis of a complex problem is part of the critical thinking component of identifying the focus.

Identifying and analyzing the problem naturally are found at the beginning of a critical thinking process. Sometimes, however, it is necessary to come back to this component in order to reformulate the problem or analyze it differently (or for the first time). And it is important throughout the critical thinking process to maintain one's focus on the central problem or thesis, so as not to wander off into irrelevancy.

For further evaluation and an eventual judgment, we must grasp the meaning of the problem. If we are thinking critically about an article in a medical journal, for example, we should ask if it is a description of an observation, a comparison of two or more sets of observations to explore some cause-effect relationship, a comparison of two or more groups in a controlled experiment or clinical trial to study treatment effectiveness, a search for factors of good or bad prognosis in an experimental or observational study, or a comparison of alternative treatment methods. The nature of the problem, as determined by the answer to our question, will determine what kinds of reasoning and argument are relevant.

Clarification of meaning goes beyond classifying the problem and inferring the appropriate method of investigation. It can involve clarification of terms and concepts used in the statement of the problem or in any part of the evidence, reasoning, or argument brought to bear on it. An important component of clarifying meaning in an evidence-gathering critical thinking process is to operationalize vague terms such as 'depressed' or 'feeling tired'. Although clarifying meaning comes naturally at the beginning of a problem-solving type of critical thinking, it can occur at any stage of a critical thinking process.

Besides clarifying the meaning of the problem as a focus of study, we must also elucidate its logical 'architecture'. Reasoning is thinking directed to a conclusion. It must be rooted in premises that are not themselves conclusions of previous reasoning. These may be assumptions, established scientific theories, and the like. But they will often include data, i.e. primary observations. Such observations are the evidence on which our thinking should be based.

If the critical thinking is critical appraisal of an array of already produced arguments, the evidence will be the data reported in the ultimate premises of these arguments. In that case, the task of gathering evidence is primarily one of analyzing the structure of the arguments in the text being appraised, so as to identify their ultimate premises. It may also be necessary to gather evidence not included in the arguments under consideration, as a means to assessing their quality and overall result.

If the critical thinking is reflective thinking about an open problem, gathering evidence will involve conducting the sort of study indicated by the classification of the problem at the stage of clarifying its meaning.

Once we have identified or gathered our evidence, we need to assess its quality. The ultimate premises relevant to the critical thinking problem must be checked to determine if they are true, by seeing whether they are justified. General claims would typically receive their justification from well-designed analytical studies, perhaps graded according to some standard hierarchy, such as that of evidence-based medicine. Particular claims typically rest on observation, whether immediately or through the interpretation of data as information.

A logician will focus mainly on the quality of the inferences involved, but for comprehensive critical thinking, evidence is equally important. As illustrated in the accompanying flow chart, good evidence must complement good inferences.

Besides assessing the evidence, we must determine what follows from it. If we are critically appraising an array of arguments, our question is whether each inference in the array is justified. Is the path from the premises to the conclusion right? Do the premises really lead to the stated conclusion? Are premises and conclusions held strictly within a pre-defined problem and question? According to an approach due to the philosopher of science Stephen Toulmin (1958), the basic question is whether there is a justified warrant that applies to the inference from premises to conclusion in each single argument. If the warrant is not universal, but only presumptive or probabilistic, a further question is whether there are exceptions (contraindications, rebuttals) in the particular case that dictate a rejection of the inference (and perhaps of the conclusion).

If we are engaging in constructive critical thinking in which we ourselves are gathering evidence, we must use justified warrants in drawing conclusions from our good evidence. These warrants must be kept in mind in designing the systematic observation or experiment in which the evidence is gathered. Thus, when critical thinking involves gathering evidence, the inferential component both precedes and follows the evidence-gathering and evidence-assessing components.

One way in which critical thinking goes beyond the logical appraisal of a single argument or piece of reasoning is to look to other considerations which are not mentioned in a text being critically appraised, or not explicitly part of gathering and assessing evidence and drawing inferences from it. In designing a study of some question, these other considerations will include a critical review of the relevant peer-reviewed literature. In evaluating the inferences in an array of existing arguments, they will include attention to possible exception-making circumstances (rebuttals). They also include consideration of challenges that could plausibly be raised regarding the conclusion one wants to draw—e.g. other possible explanations of the data one has gathered, objections to and criticisms of one's premises or inferences, situational factors that put the evidence in a new light. The implications of the conclusion may also need to be taken into account, as Dewey pointed out in his original 1910 definition of reflective

thought. We may ask if our conclusions are probable in the light of other well-established information ('knowledge'). We may also be interested in whether our conclusions confirm or improve our existing understanding of the problem. Finally, we may be asking ourselves if our conclusions provide some new insight into the problem of interest.

Finally, the critical thinker must take a stand on the main question or problem. If it is a question of what to believe, some judgment (possibly qualified) should be reached on the basis of all the components of the critical thinking process. If it is a question about what to do, some decision should be made on what is the best path among all the options under consideration.

Here it is worth noting that, if a critical appraisal finds serious flaws in an array of arguments for some conclusion, it does not necessarily follow that this conclusion is false. Showing a premise to be false or an inference to be unsound does not establish the falsehood of the conclusion. Someone can accidentally stumble on the truth by reasoning badly from a false premise, as when someone reasons that Wuhan is in China because it is the capital of Outer Mongolia. The moral of this example is clear: If in your critical thinking you determine that an argument has a bad premise or a bad inference (or both), you have not thereby shown that the conclusion is false. You have only shown that this argument does not establish its truth.

It would be desirable to complete a critical thinking process by some sort of grading of how well the process was conducted. Some summary of the correctness or incorrectness of all the above-mentioned components of the critical thinking process has to be made. Is the overall process good or bad? What are its strongest and weakest points? For the moment, however, there is no directional categorical scale to score a particular critical thinking analysis of a given problem.

If we compare the critical thinking process as just described to logical appraisal of an argument, we can identify three major differences:

1. Critical thinking extends well beyond a single argument.
2. There is a creative component represented by proposing and evaluating alternatives as well as choosing the best of them.

3. Critical thinking involves critical assessment of evidence itself. The critical assessment, selection, use, and evaluation of evidence are part of any evidence-based approach, be it in medicine or elsewhere.

3. Critical thinking as an educational ideal

3.1 The case for educating students to think critically

In my view, it should be a goal of any system of education to teach the knowledge, develop the skills, and foster the attitudes and dispositions of a "critical thinker": someone who thinks critically when it is appropriate to do so, and who does so well. The ability to think critically, in the sense just described, is an important life skill. Everybody encounters from time to time perplexities about what to believe or what to do, both in everyday life and in specialized occupations. Skillful critical thinking is by definition more likely to lead to a satisfactory resolution of such perplexities than inadequate reflection or a knee-jerk reaction. A disposition to respond to perplexities with skillful critical thinking is thus helpful to anyone in managing their life. Furthermore, although most people develop some disposition to think critically and some skill at doing so in the ordinary course of their maturation, especially in the context of schooling, focused attention on the knowledge, skills and attitudes of a critical thinker can improve them noticeably. For example, in a study of the effectiveness of computer-assisted instruction in critical thinking (Hitchcock 2004), I found that, at the beginning of a critical thinking course, on a standardized test of critical thinking skills the average score of several hundred undergraduates who had already completed at least one year of university courses was 17 out of 34. At the end of the course, the average score on this standardized test had risen to 19 out of 34, a gain of half a standard deviation, enough to be noticeable, and far more than the expected gain of .05 of a standard deviation (Pascarella & Teranzini 2005). Other studies have found even greater average gains from taking a course in critical thinking, ranging as high as 1.5 standard deviations. Such results point to just one respect in which explicit instruction in critical thinking can make it better. More generally, a student can improve thinking of any sort in six different respects: awareness, effort, attitude, organization, sub-skills and smoothness (Swartz & Perkins 1990, p. 24). For all the reasons just mentioned, it makes sense to make critical

thinking an explicit goal of any educational system, and especially of any system of post-secondary education.

3.2 Ways of developing critical thinking

How can this goal be achieved? Three points need to be made at the outset. First, it is not enough just to list critical thinking as the goal of an educational program or of an educational institution. Something must be done consciously to see that the education provided actually fosters critical thinking. Second, although educational reform should be motivated by a vision of a critical thinker as an ideal to be striven for, it should be recognized that in practice any educational system can only hope to move its students closer to this ideal. Not every student will reach it. Third, all the critical thinking skills in the world will get you nowhere without content knowledge of the domain about which you are thinking. That does not mean, of course, that domain knowledge is enough. One needs to apply the strategies and skills of a critical thinker to the domain knowledge in question.

There are two pure models for incorporating the enhancement of thinking in an educational program (Swartz & Perkins 1990, pp. 67-128). One model is infusion, where the strategies, skills, dispositions and attitudes of a critical thinker are developed in the context of subject-matter instruction. A unit in a history course, for example, might be an occasion for teaching categorical syllogistic and using the system of enthymemes associated with it to identify assumptions implicit in the reasoning of key argumentative texts from the period. The other pure model is stand-alone instruction, in the form of a separate course in critical thinking, using everyday examples that do not require advanced subject-matter knowledge. One can combine these pure models by having a stand-alone course that is reinforced by infusion in subject-matter courses. Infusion in subject-matter instruction has the advantage of ready-made domain knowledge as input to the critical thinking process. It faces a challenge of facilitating transfer of the skills and attitudes of a critical thinker from the subject-matter in question to other subjects and to the everyday life of the students. Separate instruction in critical thinking, in a dedicated course, can develop the skills and reinforce the attitudes across a wide range of subject matters, but faces the challenge that many students may have inadequate knowledge of the subject-matter of some of the examples. Theoretically, therefore, a combination of

infusion and separate instruction would seem ideal. However, such a combination is hard to achieve without a strong commitment of an educational institution, and especially its senior academic leadership, to teaching critical thinking across the curriculum. A combined approach would require adoption of a basic core of terminology and knowledge that could be amplified and adapted in various subject-matter courses, as well as developed in a separate course dedicated to teaching critical thinking. A successful example, in the neighbouring field of problem solving, is the integration in the chemical engineering program at McMaster University of courses in problem solving with content courses.

3.3 Teaching critical thinking in a stand-alone course: principles of design

Let us suppose, however, that we are teaching critical thinking in a stand-alone course. What principles should guide the design of such a course? I propose to offer some tips. Since this address concerns critical thinking, I will provide a rationale for each suggestion, thus permitting critical appraisal of it.

(1) <u>No one right way</u>: There is no single right way to teach a critical thinking course. The design of the course is a means to an end, and the effectiveness of the chosen means is influenced by the background of the teacher, the background and abilities of the students, the resources available and other situational factors. Further, even when all these factors are specified, there may be more than one effective means for imparting the knowledge base, improving the skills and fostering the attitudes of a critical thinker.

Some jurisdictions specify quite prescriptively the content of a required critical thinking course. Since 1980, the state university system in California has required all students to pass a course in critical thinking before graduation, as part of its requirements for general education. The executive order 338 which mandated this requirement described it as follows:

> Instruction in critical thinking is to be designed to achieve an understanding of the relationship of language to logic, which should lead to the ability to analyze, criticize, and advocate ideas, to reason inductively and deductively, and to reach factual or judgmental conclusions based on sound inferences drawn from unambiguous statements of knowledge or belief. The minimal competence to be

expected at the successful conclusion of instruction in critical thinking should be the ability to distinguish fact from judgment, belief from knowledge, and skills in elementary inductive and deductive processes, including an understanding of the formal and informal fallacies of language and thought. (Dumke 1980)

In my view, this statement is unduly prescriptive, and indeed incorporates questionable assumptions and distinctions. But it gives a good sense of what in general a critical thinking course might be expected to aim at.

(2) Communicate goals clearly: The goals of the course should be clear to the instructor and should be communicated to the students at the very beginning. The students have a better chance of achieving the goals if they and the instructors both know what they are and both know that the other knows what they are.

(3) Motivate the students: It is helpful if the students can acquire at the beginning a sense of the advantages to them of improving their critical thinking skills. One way to foster such an appreciation is to ask students to think of situations in which it would be helpful to think critically about a problem. A strong external motivation is the help that the course can give in writing tests of reasoning skills for admission to medical or law or business school.

(4) Use a framework: Use, and communicate to the students, an overall framework for the critical thinking process, like OMSITOG or FRISCO or the seven-component checklist in Jenicek and Hitchcock (2005). Such a framework puts the various skills into a coherent structure that students can use subsequently.

(5) Foster a critical spirit: The goals should include fostering the attitudes of a critical thinker as well as developing skills and imparting the required knowledge. Fostering a critical spirit is important, in order to avoid reinforcing the common human tendency to see the faults in others' views and ignore the faults in our own. As Swartz & Perkins (1990, p. 38) point out, we tend to produce flimsy rationales for our own position and to ignore the other side. To counteract this tendency, we need to work at understanding the reasons people have for adopting points of view contrary to our own, for example by investigating the best arguments on all sides of a given issue. In addition to fostering an attitude of open-mindedness, it is helpful in my view to try to increase the confidence of one's students in their own ability to reach reasoned judgments on

complex and controversial issues. Giving them experience in this sort of exercise is a very helpful way to do so. Although it is hard to rest part of the grade for the course on development of the attitudes of a critical thinker, you can encourage their development. An important way of doing so is to model the critical spirit yourself, for example by being open to challenges to your own expressed opinions and arguments or by examining sympathetically different perspectives on a controversial issue under discussion. Another way of developing the attitudes of a critical thinker is to assign tasks that require students to articulate a point of view opposite to their own, with the supporting arguments for that position.

(6) <u>Prefer depth to breadth</u>: If you have a choice between an ambitious agenda that you may have to rush through and a less ambitious agenda that you are sure the students can manage, choose the less ambitious agenda. It is no use "covering" an extra topic if most of the students don't learn much about it. One can put this suggestion in the form of the paradox: *Less is more*. In other words, if you have fewer topics, the students will learn more. An important decision in selecting your goals is whether to focus on reactive critical thinking that appraises others' statements and arguments or to develop constructive critical thinking in the context of solving unstructured problems and making complex decisions (Swartz & Perkins 1990, pp. 111-114). Despite the need to have realistic goals, it may be wise to work from the broader conception of critical thinking that includes the construction of arguments. If we look at other kinds of skilled performance, such as crafts and athletics, we can readily see that developing the skill of doing it oneself brings with it an ability to appraise the performances of others, but not vice versa. The same may be true of the skill of making reflective judgments and decisions in a reasonable way. A course teaching constructive critical thinking could include among its topics problem solving, decision making and finding good information (Swartz & Perkins 1990, p. 119)—topics missing from a course restricted to reactive critical thinking. However one restricts one's goals, it would be wise to let one's students know about the limitations of the course, so that they do not get the false impression that they are getting a thorough coverage of all the strategies and skills involved in critical thinking.

(7) Use bridging: Bridging is making links between the student's real-world experience outside the classroom and the experience inside the classroom. Bridging should go in two directions. First, bridge from what the students already know to what you are trying to teach in a particular lesson. A course in critical thinking should build on the critical thinking skills and critical spirit that students already have. It should seem like a natural development of their existing repertoire, not like something alien to them. Second, bridge from what you teach in a particular lesson to the students' activities outside the classroom, whether in their everyday life or in their other courses (as in the examples given by Swartz & Perkins (1990, pp. 123-126)). Refining students' critical thinking skills and fostering a critical spirit is not much use unless students will bring to bear those skills and that spirit in situations outside the classroom. Bridging begins this process of transfer, and encourages it.

(8) Use salient current issues: Take advantage of salient controversial issues as focuses for critical thinking. For example, I was teaching a critical thinking course in September 2001 when four planes were hijacked in the United States and flown into the twin towers of the World Trade Center and into the Pentagon in Washington. This event and its aftermath provided an opportunity to show how various critical thinking skills could be brought to bear on the problem of terrorism. I prepared a page on critical thinking and terrorism, with links to relevant Web sites; it is still on the Web, at http://www.humanities.mcmaster.ca/~hitchckd/terrorism.htm . Relating critical thinking to an event like the September 11 attacks that grips the attention of all your students is an effective way to demonstrate the relevance and usefulness of what they are learning.

(9) Use real or realistic examples: It is easy to spend a lot of time on skills that are not really very useful in thinking through complicated problems or critically appraising the views and arguments of others. In textbooks, a sign of such irrelevance is that the exercises are artificial and do not correspond to anything that one would be likely to encounter in real life. A check on usefulness is to use real examples, or at least realistic ones. It can take a lot of time to find examples, although the World Wide Web has made that task much easier. You can enlist your students to help you, by assigning them tasks of finding examples, as part of bridging from the course to the real world.

(10) <u>Pick your examples with care</u>: You want examples on topics that are interesting, not just at the time but also four or five years from now when you use them in another offering of the course. Avoid examples on ephemeral issues that will soon cease to be of interest. Make sure that the examples are manageable, requiring for their analysis or evaluation only information that your students can reasonably be expected to have at their disposal. Make sure that the examples are of an intermediate level of difficulty for the skill that you are teaching with them, neither too easy nor too hard. In developing a skill, it makes sense to work from easier and more obvious examples to examples that are more difficult. Finally, pick examples from a variety of subject-matters, so that students see for themselves that the skills they are refining have quite general application.

(11) <u>Provide guided practice with feedback</u>: Make sure that the students get plenty of guided practice with feedback. The guidance will come from your instruction and from the textbook. The practice can take place in class, or in tutorials, or through homework. As reported in (Hitchcock 2004), I have found the computer-assisted tutorials developed by my colleague Jill LeBlanc quite helpful; they are available online at http://www.wwnorton.com/lemur/# (accessed 2011 February 17). I have also found classroom response systems, colloquially known as "clickers", quite helpful, although one can fit only a few examples into a single class. Derek Bruff's *Teaching with Classroom Response Systems: Creating Active Learning Environments* (2009) is a useful guide to the use of this new technology.

(12) <u>Check for understanding</u>: Related to the previous point, check to see that the students understand what you are teaching them and can apply it. One way to do so is to display in class a multiple-choice item that tests a skill just taught, then ask students to vote for the answer they think best by a show of hands or with a classroom response system. A large percentage of incorrect answers indicates a need for further instruction, perhaps after hearing from those who answered incorrectly as to why they did so. Such immediate checking is particularly important in large classes, where one can lose the students without even realizing it.

(13) <u>Encourage meta-cognition</u>: Incorporate into your assignments encouragement of students to be aware of and direct their own thinking (Swartz & Perkins 1990, pp.

177-187). For example, you could ask students to recall a bad decision or incorrect judgment, then invite them to reconstruct the thinking that led to the bad outcome and find out if there was some mistake in it that they could avoid the next time they find themselves in a similar situation. Or you could have them articulate their thinking to each other in pairs as they work through an assigned task, with the listener recording the thinking process involved and reporting it back.

(14) <u>Think about context</u>: Be aware of the problem of inadequate context for thorough treatment of brief examples. There are various solutions to this problem. First, be receptive to alternative responses to examples by students who imagine a different context than the one you have on mind. Second, consider using a number of related examples that bear on a single issue, so that the required context can be provided; Swartz & Perkins (1990, pp. 120-121) mention as an example a course that used the debate over Harry Truman's decision to authorize dropping atomic bombs on Japan in 1945 as a focus for teaching decision-making strategies and critical thinking skills. Third, consider a writing assignment which requires gathering evidence and argument from a number of sources on the same issue, thus providing the required context.

(15) <u>Watch for empty use of technical terminology</u>: Discourage use of the technical terminology of the course as a substitute for actually engaging with the content of examples. In critiquing an argumentative passage, students should have something substantive to say about the content of the premises on which its argument is based and about the strength of support they give to the main thesis. Give low marks for just saying that the premises are dubious and the inference weak; your students need to explain what is dubious about the premises and why the inference is weak.

(16) <u>Design multiple-choice items carefully</u>: If you are going to base the students' grades at least partly on multiple-choice items, put a lot of care into designing them well. Figure out first what it is important for your students to know or do, and then think about how to test their knowledge or ability through a multiple-choice format. Don't just take the line of least resistance of testing things for which it is easy to construct multiple-choice items. Use real or realistic examples in your items, to reflect the sort of tasks you want your students to be able to do. Check your items for soundness before using them on a test. I generally create a large pool of items and have five or six people with

experience teaching critical thinking answer them independently, with any comments they care to make; surprisingly often, I have to throw out items because there is no consensus among the experts on the correct answer. This divergence is inevitable with items requiring judgment and evaluation. Check the performance of your students on each item you use, to see if the distribution of responses indicates something bad about the item, in which case you will need to make an adjustment to the mark. Keep a record afterwards of your students' performance, so that you know whether to use an item again. Ideally, about 70 per cent of your students should get the correct answer, with the rest being distributed evenly among the distracters.

3.4 Resources on the Web

There are helpful resources about critical thinking on the Web. I recommend first the Web site on critical thinking developed by Robert Ennis, which you can find at www.criticalthinking.net . There are also links to useful sites on the Web site of the Association for Informal Logic and Critical Thinking (AILACT) at http://ailact.mcmaster.ca/ (accessed 2011 February 16). Finally, the philosopher Tim van Gelder of the University of Melbourne in Australia has a useful directory of quality online resources about critical thinking at http://austhink.com/critical/ (accessed 2011 February 16).

4. Summary

Let me summarize what I have said. I traced the development of conceptions of critical thinking over the past 100 years, since the publication in 1910 of John Dewey's *How We Think*. From the somewhat bewildering sequence of definitions of critical thinking, I extracted the common thread that critical thinking is a type of thinking that is oriented to making a judgment on some question, and that does so by looking back in a reasonable way at the evidence relevant to the question. Critical thinking, in the apt formulation of Robert Ennis, is "reasonable reflective thinking focused on deciding what to believe or do" (http://www.criticalthinking.net/; accessed 2011 February 17). I noted three issues on which theorists of critical thinking divide: whether it is purely reactive or also constructive, how important to good critical thinking are skills as opposed to attitudes, to what extent there are generic critical thinking skills. I then noted some commonly recognized critical thinking skills: clarifying meaning, analyzing arguments, evaluating

evidence, judging whether a conclusion follows, drawing warranted conclusions. And I noted some commonly recognized attitudes of an ideal "critical thinker": open-minded, fair-minded, searching for evidence, trying to be well-informed, attentive to others' views and their reasons, proportioning belief to the evidence, willing to consider alternatives and revise beliefs. I presented three checklists of components of the critical thinking process, and described the seven components of the checklist due to Milos Jenicek and myself (Jenicek & Hitchcock 2005): problem identification and analysis, clarification of meaning, gathering the evidence, assessing the evidence, inferring conclusions, considering other relevant information, overall judgment. Any such checklist is not necessarily a sequence; in a critical thinking process one can jump back and forth between various components of the checklist. On the basis of the conception of critical thinking thus developed, I argued that critical thinking overlaps with the logical appraisal of arguments, but is different from it in that it extends well beyond a single argument, has a creative component, and involves critical assessment of evidence. I then argued that it should be a goal of any educational system to teach the knowledge, develop the skills, and foster the attitudes and dispositions of a "critical thinker", someone who thinks critically when it is appropriate to do so, and who does so well. I distinguished two pure methods of such instruction, infusion in subject-matter courses and offering a stand-alone course. I mentioned some advantages and disadvantages of each method, and argued that a combination was theoretically better than either by itself, although hard to achieve. Finally, I gave a number of tips on the design of stand-alone courses in critical thinking: adapt to your situation, communicate the course goals, motivate your students, use a checklist as a course framework, foster a critical spirit, prefer depth to breadth, use bridging, take advantage of salient issues, use real or realistic examples, pick your examples with care, give students lots of guided practice with feedback, check for understanding, encourage meta-cognition, think about context, watch for empty use of technical terms, design multiple-choice items carefully if you use them.

For an extended treatment of the issues discussed in this address, with valuable historical information and considerable agreement with my perspective, I recommend a two-part article by Robert Ennis in the journal *Inquiry* (Ennis 2011).

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