Thinking Critically about Critical Thinking

JENNIFER WILSON MULNIX

Department of Philosophy, University of Massachusetts Dartmouth

Abstract

As a philosophy professor, one of my central goals is to teach students to think critically. However, one difficulty with determining whether critical thinking can be taught, or even measured, is that there is widespread disagreement over what critical thinking actually is. Here, I reflect on several conceptions of critical thinking, subjecting them to critical scrutiny. I also distinguish critical thinking from other forms of mental processes with which it is often conflated. Next, I present my own conception of critical thinking, wherein it fundamentally consists in acquiring, developing, and exercising the ability to grasp inferential connections holding between statements. Finally, given this account of critical thinking, and given recent studies in cognitive science, I suggest the most effective means for teaching students to think critically.

Keywords: critical thinking, critical reasoning, scholarship of teaching, teaching critical thinking, philosophy of education

Introduction

As a philosophy professor, one of my central goals, especially in lower-level courses, is to teach students to think critically. To this end, I undertook a research project to figure out whether a student's ability to think critically improves after taking philosophy courses, and further, whether the specific implementation of a writing portfolio project showed an increase in critical thinking skills (see Mulnix & Mulnix, 2010). Immediately, I found myself faced with certain challenges. One obvious difficulty with determining whether critical thinking can be taught, or even measured, is that there is widespread disagreement as to what critical thinking actually is or amounts to. To be sure, 'critical thinking' seems to be all the rage in current academic pedagogy. As such, in a climate where colleges and universities are increasingly demanding that their faculties instill critical thinking skills in undergraduate students, it is imperative that we begin to think critically about this concept. Yet, my survey of the literature immediately revealed that what counts as 'critical thinking' seems to vary widely. So, if we are charged with teaching students to think critically, then we need to clarify the concept; otherwise we will be shooting arrows at a target that we cannot see.

In this paper, I will first reflect on several different conceptions of critical thinking, subjecting them to critical scrutiny. In the process of surveying and discussing these accounts, I will also distinguish critical thinking from other forms of mental processes with which it is often conflated. Next, I will present my own conception of critical thinking, wherein critical thinking fundamentally consists in acquiring, developing, and

exercising the skill of being able to grasp inferential connections holding between statements. Finally, given this account of critical thinking, and given recent studies in cognitive science, I will suggest the most effective means for teaching students to develop a more critical habit of mind.

1. Competing Definitions of Critical Thinking

What is it to think critically? Michael Scriven and Richard Paul state:

> Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.

> Critical thinking can be seen as having two components: 1) a set of information and belief generating and processing skills, and 2) the habit, based on intellectual commitment, of using those skills to guide behavior. It is thus to be contrasted with: 1) the mere acquisition and retention of information alone, because it involves a particular way in which information is sought and treated; 2) the mere possession of skills, because it involves the continual use of them; and 3) the mere use of those skills ('as an exercise') without acceptance of their results. (Scriven and Paul, 2008a)

This is a rather thorough and informative definition of critical thinking. Notice that, according to Scriven and Paul, critical thinking is an 'intellectually disciplined process'. We can draw out two important consequences from this claim. First, critical thinking must be a learned skill. Second, critical thinking is a habit of mind—an intellectual virtue—of being disposed to using and accepting the results of these reasoning skills. That is, critical thinking is a set of intellectual virtues possessed by good thinkers. Hence, it does not consist in the mindless application of a set of logical principles 'as an exercise'. This implies that there must be some sort of metacognitive awareness on the part of the thinker of her own thought process. Critical thinking involves, as do all virtues, a set of habituated skills possessed by the agent and applied to her thinking.

This highlights the contrast between merely constructing a logical argument, which can be done in a mechanical way, and thinking critically, which requires careful application of the skills of sound reasoning to patterns of belief and a commitment to accept the results of that reasoning. Harold Brown expresses the distinction between reasoning versus merely thinking in a way that conforms to the rules of logic:

> The feature of cognitive agents that they exhibit when they adopt beliefs on the basis of appropriate reasons ... Following rules is not always required [for reasoned thinking], since one task of rational assessment is to determine which rules should be followed in a particular situation ... Mindlessly applying rules just because they are logically correct is foolish. (Brown, 1995)

Throughout their work on the theory of critical thinking, Richard Paul and Linda Elder also maintain that critical thinking encompasses elements of thought, universal intellectual standards *and* intellectual virtues. Elaborating, they claim that the relevant elements of thought are: Point of View, Purpose, Question at Issue, Information, Interpretation and Inference, Concepts, Assumptions, and Implications and Consequences, while the intellectual standards associated with critical thinking are: Clarity, Accuracy, Precision, Relevance, Depth, Breadth, Logic and Fairness. Finally, the intellectual virtues central to critical thinking are: Intellectual Humility, Intellectual Courage, Intellectual Empathy, Intellectual Autonomy, Intellectual Integrity, Intellectual Perseverance, Confidence in Reason, and Fairmindedness (Paul & Elder, 2008):

> Critical Thinking is that mode of thinking—about any subject, content, or problem—in which the thinker improves the quality of his or her thinking by skillfully analyzing, assessing, and reconstructing it. Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking. It presupposes assent to rigorous standards of excellence and mindful command of their use. It entails effective communication and problem-solving abilities, as well as a commitment to overcome our native egocentricism and sociocentrism. (Scriven & Paul, 2008b)

> ... Critical thinking is self-guided, self-disciplined thinking which attempts to reason at the highest level of quality in a fair-minded way. People who think critically consistently attempt to live rationally, reasonably, empathetically. They are keenly aware of the inherently flawed nature of human thinking when left unchecked ... They use the intellectual tools that critical thinking offers—concepts and principles that enable them to analyze, assess, and improve thinking. They work diligently to develop the intellectual virtues of intellectual integrity, intellectual humility, intellectual civility, intellectual empathy, intellectual sense of justice and confidence in reason. (Elder, 2007)

Nevertheless, there is a danger in construing critical thinking as a set of virtues if that is understood as moral virtues. One worry with the above characterization centers on the explicit reliance on moral terms like 'being fair-minded' or 'being empathetic' or 'being committed to a sense of justice', as this seems to mix up moral virtues with intellectual virtues. Critical thinking, as an intellectual virtue, is not directed at any specific moral ends. That is, it does not intrinsically contain a set of beliefs that are the natural outcomes of applying its method. For instance, two critical thinkers can come to hold contrary beliefs despite each applying the skills associated with critical thinking well and honestly. As such, critical thinking has little to do with *what* we think, but everything to do with *how* we think. Accordingly, any model of critical thinking that asserts that there are definite ends at which critical thinking aims—in terms of what we should or should not believe, or how we should or should not behave—is deeply suspicious.

Insofar as the critical thinker is made more autonomous by learning to utilize the skills of critical thinking, it is an insult to suggest that she cannot determine for herself what the morally good life consists in. This is to beg the question against differing ethics and outlooks. The skills associated with quality critical thinking will never prescribe any sort of attitude or ethical stance concerning egocentrism or sociocentrism. After all, some

rather influential and respectable moral philosophies center on the idea that morality is founded in individual self-interest and others focus on the interests of one's society. In fact, even versions of moral nihilism are argued in ways perfectly consistent with the precepts of solid critical thinking. To state that critical thinking precludes these positions is to make it a moral theory, which it clearly is not. It is a theory about how to *think*, not about how to *live*.

Scriven, Paul and Elder suggest that critical thinking consists in the myriad of skills they list. However, it seems clear that in order to develop these skills, the thinker must be in possession of at least one very important antecedent foundational skill: that of recognizing the inferential connections that hold between statements. If a thinker is to live up to the standards of clarity, accuracy, precision, consistency, relevance, and so on, then she must first be highly capable of grasping evidential relationships that hold between statements. In other words, these other important aspects of critical thinking depend upon a prior ability to recognize inferential connections. Thus, the other skills suggested by Scriven, Paul and Elder are in fact derived from this more basic foundational ability. This is where I diverge with Scriven, Paul and Elder's conception of critical thinking. While I agree that critical thinking amounts to an intellectual virtue, I think that the above accounts of critical thinking fail to include this vital foundational skill, which is necessary for the acquisition and development of the other skills contained in the intellectual virtue of critical thinking.

Of course, not all proposed definitions of critical thinking analyze the concept as an intellectual virtue. For example, Lewis Vaughn claims that critical thinking consists in following a set of procedures:

> Critical Thinking [is] the systematic evaluation or formulation of beliefs, or statements, by rational standards. Critical thinking is *systematic* because it involves distinct procedures and methods … And it operates according to *rational standards* in that beliefs are judged by how well they are supported by reasons. (Vaughn, 2005, p. 4)

Ken Petress (2004) also seems to identify critical thinking quite directly as a set of rational criteria that such thinking satisfies, rather than a set of intellectual skills possessed by a thinker. Insofar as a thinker meets these criteria, he has reasoned well. Yet, Petress does not claim that the thinker must be habitually disposed to think in these ways in order to think critically. It is enough that he does so on this occasion to claim that he has successfully employed the criteria of critical thinking. We see, then, that both Petress and Vaughn, among others, think of critical thinking as specific act of reasoning that conforms to a set of rules of rationality. Most likely, these principles are the sort of axioms one would learn in an Introduction to Logic class. Hence, they do not claim that there need be any metacognitive awareness on the part of the thinker himself concerning the thinking process in which he is engaged, in order for him have reasoned well. Furthermore, there is no need on the part of the reasoner to be committed to accepting the results.

Instead, to think critically, according to Petress and Vaughn, is to mechanically follow a set of guidelines in the formulation of an argument. In defining critical thinking this way, there is no mention of intellectual skills. Instead of trying to develop critical habits of mind, one need only consult a set of procedural rules and apply them in a rather

mechanical way. But, if critical thinking is a possession of certain skills, then, as with other skills, it cannot be learned through the formulaic following of procedural rules. For instance, in learning how to ride a bike—in acquiring that skill—the learner will not get very far if she tries to concentrate on applying a set of physical laws that govern motion, balance, torque and the like. Instead, she must practice. For, in developing the ability to control the movements of the body requisite for riding a bike, there is no surrogate for repetitive practice. In this sense, the bike-rider is gaining what is sometimes called a 'knowing-how'. This is contrasted with content knowledge, or a 'knowing-that'.[1] Petress and Vaughn imply that critical reasoning amounts to a form of knowing-that—of memorizing the appropriate intellectual moves. However, I think it is better to conceive of critical reasoning as a form of knowing-how—of gaining an ability to control the 'movements' of our mental processes in certain ways.

Others, such as Barbara Thayer-Bacon, claim that the current concept of critical thinking is too limiting:

> It is limited in that vital tools that help us to be critical thinkers are ignored or diminished, such as our tools of imagination, intuition, and emotional feelings, while our reasoning tool is highlighted and underscored.[2]

This thought is also echoed by Anne Phelan when she states that, 'the reliance on reason (that characterizes critical thinking) … is limiting' (Phelan, 2001). Both argue for a more inclusive concept of critical thinking, one that seeks to foster intellectual virtues other than mere reasoning skills. Such an account of critical thinking attempts to broaden its scope to encompass all thought processes.

This type of charge against critical thinking—that its emphasis on reason to the exclusion of other types of mental cognition is a problem with the concept itself—is fundamentally misguided. It runs the concept together with other different forms of mental processes: imagination, intuition and emotional responses. Yet, critical thinking is an inherently reason-based process, and as such, it cannot escape the central focus it places on reason. That this is the case is undeniable. Hence, if we were to include in our concept of critical thinking all mental processes, then the term would cease to have any meaning, in that it would be unable to disambiguate critical thinking from other mental processes. Accordingly, it is important to keep in mind that critical thinking is a *type* of thinking; it is not the same as thinking in general. We must not confuse critical thinking with other forms of thought:

> Although thinking critically utilizes higher order thinking, critical thinking and higher order thinking are not equivalent. Critical thinking is not a 'catch-all' category for higher order thinking. It is one of a family of closely related forms of higher order thinking. Others include problem solving, creative thinking and decision making. (Rudd, 2007, p. 48)

The attempt to subsume other thought processes within the category of critical thinking would make it an amorphous catch-all for mental life in general. Having said this, there is still a need for robust debate concerning whether critical thinking and reasoning holds a privileged position with respect to attaining knowledge over these other thought processes.[3] I think it does; however, I do not have the space here to argue that point.

There are still others who argue that critical thinking is not a skill of any sort. Daniel T. Willingham, professor of cognitive psychology at the University of Virginia, describes what he believes is the common conception of critical thinking in the following way:

> In layperson's terms, critical thinking consists of seeing both sides of an issue, being open to new evidence that disconfirms your ideas, reasoning dispassionately, demanding that claims be backed by evidence, deducing and inferring conclusions from available facts, solving problems, and so forth. (Willingham, 2007, p. 8)

However, according to Willingham, this basic understanding of the concept of critical thinking has led educators down a dangerous path of trying to improve students' abilities in the arena of critical thinking in much the same way as we would try to improve any other skill. And, according to Willingham, this sort of attempt to improve students' reasoning abilities is doomed to failure. Willingham's reasoning is that while many consider critical thinking to be a skill (such as riding a bicycle) that can be employed in all situations, critical thinking is not actually this kind of skill. In fact, it is not a skill at all:

> The common conception of critical thinking ... as a set of skills is not accurate. Critical thinking does not have certain characteristics normally associated with skills—in particular, being able to use that skill at any time. If I told you that I learned to read music, for example, you would expect, correctly, that I could use my new skill whenever I wanted. But critical thinking is very different. (Willingham, 2007, p. 15)

The difference, argues Willingham, is that critical thinking is fundamentally intertwined with domain knowledge, and as such, appears to be highly discipline-specific and non-transferable across disciplines. That is, students who are competent to think critically in one discipline have difficulty transferring it to another:

> The processes of thinking are intertwined with the content of thought (that is, domain knowledge). Thus, if you remind a student to 'look at an issue from multiple perspectives' often enough, he will learn that he ought to do so, but if he doesn't know much about an issue, he *can't* think about it from multiple perspectives. You can teach students maxims about how they ought to think, but without background knowledge and practice, they probably will not be able to implement the advice they memorize. (Willingham, 2007, pp. 8–10)

For example, in an experiment conducted on high-school students solving math-problems, students were able to answer some problems and not others, despite the fact that the problems all shared the same deep structure (that is, the solutions were capable of being determined according to the same set of mathematical moves). The students were more likely to focus on the surface structure and treat each problem as unique. To illustrate, one problem focuses on planting rows of vegetables, while another concerns columns of band marchers. Despite the fact that the two problems shared similar deep structures, 'few subjects—just 19 percent—saw that the band problem was similar and that they could use the garden problem solution' (Willingham, 2007, p. 11).

Willingham claims that, because thought processes are mixed in with what is being thought about, coupled with the claim that students rarely recognize the 'deep structure' of a problem and focus only on its 'surface structure', critical thinking is irreconcilable across disciplines. And, since critical thinking is domain-specific, it is not essentially a skill set that can be transferred easily across domains. If this is an accurate understanding of critical thinking, then it would appear that there are no identifiable universal principles and methods that apply across all domains of knowledge. Instead, each set of legitimating moves are local and relative to a particular domain. Thus, to approach critical thinking as if it were capable of being applied in a way detached from particular domain content is to misunderstand the process of human thinking.

However, Willingham's conclusions seem a bit hasty, for two obvious reasons. First, his understanding of critical thinking flies in the face of a great deal of the received wisdom on critical thinking, especially in his claim that it is domain-specific. Second, his claim that critical thinking is not a skill (or set of skills) is unconvincing and misleading. Regarding the first criticism, recall what Scriven and Paul claimed about critical thinking: 'In its exemplary form, it is based on universal intellectual values *that transcend subject matter divisions*' (Scriven & Paul, 2008a, my emphasis). Indeed, I think the ability to grasp evidential relations is exactly that sort of skill that is transferrable across domains. Moreover, according to Lewis Vaughn:

> Critical thinking has extremely broad application. Principles and procedures used to evaluate beliefs in one discipline or issue can be used to assess beliefs in many other arenas. Good critical thinking is the same everywhere. (Vaughn, 2005, p. 8)

I agree that a student cannot implement the skills of critical thinking without having at least some working knowledge of the topic about which they are being asked to think. After all, we need some set of data on which to exercise our skills as thinkers. Nevertheless, this does not entail, as Willingham suggests, that critical thinking skills themselves are domain-specific. Dependent on domain knowledge in order to be exercised?—Yes. Different skill sets for different domains?—No.

Moreover, if a student is a proficient critical thinker, then even if she lacks the relevant domain knowledge to formulate informed opinions on the matter, at the very least, she ought to be able to identify and formulate questions relevant to obtaining the necessary information to engage in reasoned thinking about the matter. There is a difference between having information at our disposal on the one hand, and knowing what to do with that information in order to reach reasonable and justified conclusions on the other. The former is domain knowledge, the latter is critical thinking. Willingham's criticism seems to rest on the fact that he takes critical thinking to depend on the memorization and application of intellectual 'maxims'. But this requires no more than a mechanical application of procedures without any need to understand the 'deep structure'. In fact, to grasp the deep structure of a problem—to move beyond mere surface grammar—requires an ability to grasp the evidential relations holding between types of statements. Hence, what is required to facilitate understanding of deep structure is the ability to reason critically, and not, as Willingham suggests, domain-specific content knowledge.

Turning to the second criticism, Willingham states that the reason we should not consider it a skill is because we can fail to think critically even after we have supposedly achieved the skill. However, just because a person possesses a skill, this does not mean she can always apply it to her fullest potential. Take Willingham's example: once he has learned to read music (acquired that skill), does that mean he will *always* be able to use that skill whenever he wants? No. He, too, can make mistakes, or the environmental conditions may hinder his ability to make use of the skill (perhaps there is no light to read by). Further still, he may not be able to read sheet music as quickly and fluently as a concert pianist. But this does not imply that he has not acquired a skill. Possessing a skill is always a matter of degree. The key is to recognize that possession of a learned skill is not the same as *mastery* of it, or possession of it to an excellent degree. Three-year-olds, as Willingham points out, can calculate conditional probabilities,[4] but they can also throw balls. Of course, they cannot throw balls as hard as Nolan Ryan or with the accuracy of Greg Maddux anymore than they can calculate conditional probabilities as well as the scientist or mathematician. Skills take continuous practice to be improved, but also to be maintained. Critical thinking is no different:

> Critical thinking of any kind is never universal in any individual; everyone is subject to episodes of undisciplined or irrational thought. Its quality is therefore typically a matter of degree and dependent on, among other things, the quality and depth of experience in a given domain of thinking or with respect to a particular class of questions. No one is a critical thinker through-and-through, but only to such-and-such a degree, with such-and-such insights and blind spots, subject to such-and-such tendencies towards self-delusion. For this reason, the development of critical thinking skills and dispositions is a life-long endeavor. (Scriven & Paul, 2008a)

In summary, critical thinking is a process, a skilled activity of thought. It includes a commitment to using reason in the formulation of our beliefs. It is not the same as creative, imaginative or emotion-based thinking. And, as with any skill, it can be possessed to a greater or lesser degree. Nevertheless, these virtues will be intellectual, and never moral. Being fair, being just, and being socially tolerant are ethical stances that will or will not be justified by the method of critical thinking—they are not part of that method itself. Perhaps, being rational and being moral are equivalent terms, but for this claim, we would need a solid argument that is developed through the methods of critical thinking. We cannot accept claims that morality and reason reduce to the same thing without evidence—to do so would be to fail at the method of critical thinking! Admittedly, the discussion so far is not overly informative, since it does not reveal which *specific* skills are constitutive of critical thinking. Defining how one should think if one is to think critically will consist in describing a set of thinking skills to be acquired. So, which particular set of skills must we master in order to become good critical thinkers?

2. Critical Thinking as the Ability to Grasp Inferential Connections

Critical thinking is an attempt to understand what it is for a belief to be rationally justified. As such, critical thinking techniques evaluate some beliefs in light of others. Moreover,

according to Jerry Cederblom and David W. Paulsen, critical reasoning 'is both active and open to alternative points of view' (Cederblom & Paulsen, 2006, p. 2). By 'active', they signify the ability to recognize the structure of reasoning, taking some statements as justifications for others, and then evaluating or assessing the reasoning. By 'open', they denote the disposition of being open to changing one's beliefs if a better alternative is presented. This will involve a certain detachment from our own beliefs with a willingness to consider alternative viewpoints. When two individuals disagree over which of two incompatible beliefs is true, critical thinking is a tool that allows for meaningful discussion between them. As Cederblom and Paulsen write: 'Critical reasoning is a process that emphasizes a rational basis for belief and provides a procedure for resolving disagreements by means of further inquiry' (Cederblom & Paulsen, 2006, p. 8).

Critical thinking just is that mode of thinking that seeks to justify beliefs on the evidential relations that hold between statements. Admittedly, such an understanding is not novel—it has a history as old as philosophy itself. For example, Plato argued that thinking according to reason is the mark of a well-ordered soul, while Aristotle developed a systematic approach—through the tools of syllogistic logic—to outline the principles of good reason-based thinking. Indeed, the concept of thinking clearly and in accordance with evidential relations holding between statements is the very practice of philosophy. This might explain why critical thinking classes are most often housed within the philosophy departments in university and college settings (and why they should be).

According to Christopher Kirwan, 'reasoning' actually describes two different, but closely related processes: the process of searching for reasons and the process of giving reasons (Kirwan, 1995). Searching for reasons, according to Kirwan, involves research, but is not reasoning itself. The search for reasons is often messy, since when a thinker begins her search, she often has little domain knowledge concerning the subject of her query. On the other hand:

> Giving reasons is setting them out, to oneself or someone else. This too is a process, though quite a different one from searching for reasons. Since it can be rehearsed and repeated, it is likely to be more orderly than the search was. (Kirwan, 1995, p. 748)

The giving of reasons is more orderly since it relies on systematic procedures and methods that determine when one statement counts as evidence for the truth of another. That is, there are principles of inferential support that can be studied and applied to our thinking. Given this, we can say that you reason well, or engage in critical thinking, when:

> [T]he reasons that you find, or give, *favour* (and not just seem to favour) the belief or action or response they are presented as reasons for; that is, they make it more likely that the belief is true or the action is right or the response is appropriate. (Kirwan, 1995, p. 749)

Moreover, because it is a matter of objective fact whether one statement evidentially supports another, we can develop a science of sound reasoning, wherein there are various argument patterns in accordance with good reasoning, and others—fallacies—which are not. Still, in order to give reasons that *actually* favor one's beliefs, a thinker must have acquired the ability to recognize inferential connections holding between statements. In

other words, reasoning well, or thinking critically, consists first in the ability to grasp inferential connections holding between statements in order to see a progression of evidence in the form of an argument to a specified conclusion. To be a proficient critical thinker, then, is to see clearly the relationship between evidence and conclusion, and to be proficient at providing reasons in support of one's beliefs. This must also include the ability to recognize what would count as evidence against one's beliefs.

In fact, according to studies conducted by Deanna Kuhn, the willingness and ability to see that what we believe may be false, and in such cases, to see what would count as evidence against our belief, is the core component of thinking critically:

> [T]hese two abilities—the ability to recognize the possible falsehood of a theory and the identification of evidence capable of disconfirming it—are the foundational abilities that lie at the heart of both informal and scientific reasoning. These abilities lie at the heart of critical thinking, which similarly can be regarded, at the most global level, as the ability to justify what one claims to be true. (Kuhn, 1993)

This suggests that the fundamental skill to be acquired by a critical thinker is the ability to recognize inferential connections holding between statements, where this would include the ability to understand the possibility that what we believe might be false and the ability to identify the sorts of evidence that would undermine our beliefs.

3. How to Teach Critical Thinking

Why should we want students to learn and practice critical thinking? As Cederblom and Paulsen highlight, critical thinking encourages important dialogues with oneself, allowing one to reason well and to adopt reasonable rather than simply comfortable positions—it compels us to seek a rational basis for our beliefs. Moreover, developing these skills to evaluate our own beliefs as well as the claims of others in light of evidential connections, makes for rational individuals—persons who are not easily misled into believing that for which there is no solid evidence. In this sense, critical thinking protects us from sloppy and conformist thinking and insulates us against empty dogmatism and rhetoric. Critical thinking is, then, closely tied to the development of autonomy, or the ability to decide for ourselves what we believe according to our own deliberations and not on the basis of what others claim.

However, as a teacher of critical thinking, I am in a tough spot. In order to think critically, a student must be able to grasp why certain forms of inference are acceptable and others are not. I can give students guidance by laying out for them both sound argument forms and fallacies, but this alone will not produce fully developed critical thinkers. Merely showing them examples of solid and weak inferences is not teaching them the underlying inferential links inherent in sound thought; instead, it is only modeling it for them. For example, one cannot define the word 'game' by building a list a games. These are examples of games, and as examples, they do not directly reveal what it is that makes them such. Even if we were given a list of every game there ever was or will be, the concept 'game' still will not have been defined. Likewise for critical thinking: even if it were possible to provide my students with an utterly complete set of successful

and unsuccessful patterns of inference,[5] I still might not succeed in getting the student to grasp or understand why these patterns work and others do not. In fact, grasping why a particular statement can be validly inferred from another is really a form of 'knowing-how' and not a form of 'knowing-that'—it is a skill, and as with all skills, no amount of instruction can substitute for active and deliberate practice, particularly when it comes to achieving proficiency.

Skills are taught (or, maybe more accurately, coached) in a rather straightforward way. It involves modeling the skill, having the student practice the skill, providing feedback on his performance, and some amount of natural talent. Though I can model the skill through a list of inferential patterns and fallacies, and I can model it through being a strong exemplar of the skill, nothing can replace repetitive practice. If you want to be able to hit a Nolan Ryan fastball, it will not serve you well to read books on the art of hitting a baseball. Instead, you need to get to the batting cage. And, if you want to reason well, you need to practice.

I have synthesized research from varied sources in order to help teachers design the most effective and efficient curriculum for instilling critical thinking. When examining the literature on teaching critical thinking skills, I found several consistent themes. First, we need to embed in the student a metacognitive awareness of the processes of thought itself. What can help students achieve this metacognitive awareness of the processes of thinking? The only apparently effective means to achieve this awareness is through substantial repetition of thinking exercises (Dawson, 2000). Studies about metacognitive change conducted by Deanna Kuhn indicate that 'exercise can be a sufficient mechanism to induce change, but the fact that many adults reason at a sixth grade level indicates that sufficient exercise is probably not available' (Dawson, 2000, p. 80).

Yet, far too many college undergraduates have yet to achieve proficiency in thinking critically, and the research seems to support this. In fact, many students are unable to recognize even the simplest of evidential relationships between statements. This is supported through a set of studies conducted by Kuhn, in which participants were asked to first give an opinion concerning some topic, and then second, to justify this opinion; unfortunately, the majority of participants were unable to provide *any* justification. Responding to these studies, Tim van Gelder writes, 'Such people are not incapable of reason … The problem is that they do not have a general grasp of the notion of evidence and what would properly count as providing evidence in support of their view on a nontrivial issue' (Van Gelder, 2005). This appears to suggest that the fundamental concern of any critical thinking course ought to be teaching students to 'grasp' inferential or evidential connections.

However, the ability to recognize evidential relationships is dependent upon being able to pick out premises and conclusions from extended passages. Hence, in order to develop their skills, students need a strong foundation in recognizing the difference between evidence and the conclusions they support. Dawson states that Kuhn's experiments reflect this need:

> The developmental process [Kuhn] describes requires thinking about theories, rather than merely with them, and thinking about evidence, rather than merely being influenced by it … In addition, coordination of theory and evidence

by children and lay-adults is not the same as that employed by science and scientists. Children (and many lay-adults) were, by far, less able to make the distinction between the theories they use to understand the world and the evidence that could support or refute those theories than scientists ... [However] formalizing the process may provide a metacognitive awareness of the difference between theories and evidence. (Dawson, 2000, pp. 80–81)

One way that we can help students in this regard is to employ extensive use of argument maps in the classroom. Chains of reasoning and evidence are structured hierarchically, with some premises supporting others and lending support to the conclusion either indirectly, conjointly or independently, and we can diagram these structures.[6] Moreover, studies from cognitive science support the crucial importance of argument mapping when it comes to improving students' critical thinking skills:

The crucial result from cognitive science is that students' critical-thinking skills improve faster when instruction is based on argument mapping. The main evidence for this comes from studies in which students are tested before and after a one-semester undergraduate critical-thinking course. Students in classes based heavily on argument mapping consistently improve their skills much faster than students in conventional classes. Indeed, one semester of instruction based on argument mapping can yield reasoning skill gains of the same magnitude as would normally be expected to occur over an entire undergraduate education. (Van Gelder, 2005, p. 45)

It should not be surprising that this technique helps foster critical reasoning skills, since it focuses student attention on the inferential connections between statements and how some statements can work together in a variety of ways to lend evidential support to other statements. Not only does requiring students to map arguments strengthen their ability to see evidential relationships between statements, it also greatly improves the overall structure and flow of their own writing. By mapping an argument one is advancing in a persuasive paper, a student can naturally see a structured format, which then suggests a rather straightforward outline of the paper.

Of course, mapping arguments is not the only important element of a comprehensive plan of instruction for teaching critical thinking skills. There is also evidence to suggest that true improvement in skill requires students to learn the 'theory' of critical thinking:

Beyond a certain point, improvement demands acquiring some theory. The serious critical thinker understands the theory of critical thinking. This means, in part, acquiring the specialist vocabulary. Instead of saying, 'That argument sucks', the critical thinker can say that she does not accept the conclusion, even though she grants the premises, because the inference is an example of the fallacy of post hoc ergo propter hoc. (Van Gelder, 2005, p. 44)

Students need to learn names for argument patterns and fallacies if they are to be more successful critical thinkers. And, this seems to follow from thinking of critical thinking as achieving a set of intellectual virtues. At some point in the development of a virtue, a person can proceed no further by mere habituation; she must come to understand the

underlying theory—she must come to understand *why* this behavior is a virtue in the first place. Hence, just teaching the theory of critical thinking alone will not improve a student's ability to think critically. Skill acquisition does not merely follow from knowledge of a theory; it arises independently. As an example, a beginning golfer can read an article in *Golf Digest* about how to hit the perfect draw shot, and yet, he will not have suddenly acquired the ability to do so. However, after having become a relatively proficient golfer, reading the magazine may actually help to develop the skill further.

Unfortunately, we do not live in a *Matrix* world where information and skills can just be effortlessly uploaded into our brains. In order to become proficient in any skilled domain, we need to practice that skill. And the more we practice, the better we become. Such practice will take extensive effort on the part of the student. This is why, as Van Gelder writes:

> For students to improve, they must engage in critical thinking itself. It is not enough to learn about critical thinking. These strategies are about as effective as working on your tennis game by watching Wimbledon. Unless the students are actively doing the thinking themselves, they will never improve. (Van Gelder, 2005, p. 43)

To this end, I have found that having students continuously edit their own papers (from any class they are taking) and the papers of others—with an eye to weeding out fallacies and also towards improving their argument patterns—greatly helps improve overall reasoning ability (see Mulnix & Mulnix, 2010). This type of application of theory to the student's own work is a crucial component for long-term skill retention.

Karl Anders Ericsson conducted further research in the arena of skill acquisition. He studied the habits of persons who achieved excellence in many different fields. Though Ericsson did not study critical thinking skills directly, Van Gelder asserts that it is not unreasonable to extend Ericsson's findings to the skills of critical thinking, since his studies seem to indicate a very high level of parity across different skilled activities. According to Ericsson, the sort of practice that is most helpful in developing proficiency of any skill type is 'deliberative practice'. Deliberative practice is summarized as follows:

1. It is done with full concentration and is aimed at generating improvement.
2. It is not only engaging in the skill itself but also doing special exercises designed to improve performance in the skill.
3. It is graduated, in the sense that practice activities gradually become harder, and easier activities are mastered through repetition before harder ones are practiced.
4. There is close guidance and timely, accurate feedback on performance. (Van Gelder, 2005, p. 43)

Ericsson's studies indicate that there is a direct relationship between the amount of deliberate practice one engages in, and one's level of proficiency:

> This means that our students will improve their critical-thinking skills most effectively just to the extent that they engage in lots of deliberate practice in critical thinking. Crucially, this is not just thinking critically about some topic. It also involves doing special exercises whose main point is to improve critical-thinking skills themselves. (Van Gelder, 2005, p. 43)

Accordingly, these findings should influence the sorts of assessments that we assign our students in the classroom. If we want them to develop the skills of critical thinking, we need to realize that repetition is important—students are not going to succeed in achieving proficiency in this mode of thought accidentally. What is more, students are not going to suddenly have an 'ah-ha' moment simply after reading those who are excellent critical thinkers. Van Gelder explains that this latter approach is a rather common mistake among faculty teaching critical thinking:

> For students to improve, they must engage in critical thinking itself. It is not enough to learn about critical thinking. Many college professors seem unaware of this point; they teach a course on the theory of critical thinking and assume that their students will end up better critical thinkers. Other teachers make a similar mistake: They expose their students to examples of good critical thinking (for example, having them read articles by professional philosophers), hoping that students will learn by imitation. (Van Gelder, 2005, p. 44)

This type of strategy is not effective and will do nothing to actually improve students' ability to think critically. As stated earlier, cognitive science studies reveal that we must *engage* our students in the process itself if we desire actual results. This claim reflects the most strongly supported conclusion coming out of cognitive science research concerning teaching critical thinking: students need a great deal more repetitive practice than they are receiving. Dawson writes:

> The concept of repetition is probably not *politically correct* in education today, especially if it is conceived of as a drill. Yet all the evidence from [Kuhn's] studies would indicate that becoming aware of the thinking processes, generating the ability to coordinate theory and evidence, and developing the capacity to recognize false theories is dependent on sufficient repetition of thinking tasks. (Dawson, 2000, p. 82)

That repetition is central should be no surprise given that critical thinking is a skill. All skills need extensive amounts of deliberate and varied practice to be developed, honed and maintained. We cannot hope to teach our students to be proficient critical thinkers if we do not offer them the opportunity to practice their newly learned skills frequently. Thus, any course in which critical thinking is a core curricular objective must carefully design its assessments in such a way as to reinforce, reintroduce and repeat the skills of reasoning throughout.[7]

4. Conclusion

Critical thinking is the same as thinking rationally or reasoning well. In order to reason well, a thinker must be able to give reasons for what she believes, and these reasons must actually support the truth of the statement or belief they are claimed to support. As a matter of objective fact, some statements count as evidence for others by standing in inferential or evidential relations, wherein one statement will give one a reason to believe that another statement is true. In order to give reasons that actually do support (and do not just seem to support) a given claim, a critical thinker must have learned the skill of grasping inferential or evidential links between separate statements. To be a proficient

critical thinker, then, is to understand what counts as a good inference between statements, and what does not.

Moreover, we should be careful not to confuse critical thinking with other thought processes. For example, critical thinking is not equivalent to creative thinking, nor is it equivalent to intuition or emotive response. To be sure, these other mental processes are certainly important to the psychological life of an individual and may even tap into knowledge that critical thinking—because of its method based in reason—does not. For these reasons, we may encourage individuals to develop all of their mental skills, rather than just focusing on critical thinking. Nonetheless, to say this is *not* to say that these other thought processes are part of the very conception of critical thinking itself.

What is more, we need certain pedagogical tools in order to teach critical thinking. Studies from cognitive science seem to quite conclusively suggest that the most efficient and effective way to increase a student's ability in the arena of critical thinking is through extensive deliberate practice, and in particular, through extensive use of argument mapping. Indeed, it is no wonder that mapping arguments increases students' abilities to think critically, since to think critically just is to be able to accurately grasp the inferential connections between statements.

If, as educators, we want to encourage our students to be more autonomous thinkers, and if we desire to help our students develop their critical reasoning skills, then it is imperative that we think carefully about what those skills consist in. Moreover, we should rely on empirical studies to develop pedagogical strategies that encourage improvement in this area, and we should, accordingly, design curricula and assessments carefully to target those skills. To do any less is not only to let our students down, but it is to fail at that very skill we are trying to teach.

Notes

1. For a fuller explanation of the difference between 'knowing-how' and 'knowing-that', see 'Part 1—General Introduction: The Theory of Knowledge' in Pojman, 2003.
2. Thayer-Bacon, 1998. Thayer-Bacon thinks that prioritizing reason over other cognitive processes is not just a bias in favor of one sort of mental process, but also a mark of gender bias. I agree that thinking according to the mandates of reason has been conventionally considered to be a male trait. This seems quite undeniable. Still, we cannot infer from this fact alone that reason itself is male-centered. That is, it may well be the case that women and men are equally rationally capable and the sexism present in history and even in contemporary society with respect to women's abilities to think in such ways is due to the hubris of a male-centered society in thinking that women were incapable of being rational. Perhaps the problem is not that we are being too rational, but that we are not being rational enough! For persuasive arguments to this end see, Martha Nussbaum's 1997 Lindley Lecture at The University of Kansas titled, 'The Feminist Critique of Liberalism' (Nussbaum, 1997) and J. S. Mill's *The Subjection of Women* (Mill, 1963–1991).
3. For one argument to the effect that rational thinking *does* hold a privileged position over these other processes, see Plato's *The Republic* (2003) or Kant's *Groundwork of the Metaphysics of Morals* (1996).
4. As suggested by a study conducted by A. Gopnik, D. M. Sobel, L. E. Schulz, and C. Glymour. For a description of the study and its results see Willingham, 2007, pp. 14–15.
5. Which we obviously cannot. After all, part of the reason that teaching critical thinking is so difficult is that we are capable of producing and encountering an infinite number of novel inferential patterns.

6. For a helpful model of argument mapping see Hurley, 2006, especially Chapter 1.6.
7. For a discussion of one type of assessment tool aimed at the objective of improving students' critical thinking abilities, see Mulnix & Mulnix, 2010.

References

Brown, H. I. (1995) Rationality, in: T. Honderich (ed.), *The Oxford Companion to Philosophy* (Oxford, Oxford University Press), p. 744.

Cederblom, J & Paulsen, D. W. (2006) *Critical Reasoning: Understanding and criticizing arguments and theories*, 6th edn. (Belmont, CA, Thomson Wadsworth).

Dawson, R. E. (2000) Critical Thinking, Scientific Thinking, and Everyday Thinking: Metacognition about cognition, *Academic Exchange*, Fall, pp. 76–83.

Elder, L. (2007) Our Concept of Critical Thinking (Side Bar), *Foundation for Critical Thinking*. Available at: http://www.criticalthinking.org/aboutCT/ourConceptCT.cfm

Hurley, P. (2006) *A Concise Introduction to Logic*, 9th edn. (Belmont, CA, Thomson Wadsworth).

Kant, I. (1996) *Groundwork of the Metaphysics of Morals*, in: M. Gregor (ed.), *The Cambridge Edition of the Works of Immanuel Kant: Practical Philosophy* (Cambridge, Cambridge University Press), pp. 37–108.

Kirwan, C. (1995) Reasoning, in: T. Honderich (ed.), *The Oxford Companion to Philosophy* (Oxford, Oxford University Press), pp. 748–749.

Kuhn, D. (1993) Connecting Scientific and Informal Reasoning, *Merrill-Palmer Quarterly*, 39:1, pp. 74–103.

Mill, J. S. (1963–1991) [1869] *The Subjection of Women*, in: *The Collected Works of John Stuart Mill*, 33 Vols. (Toronto, University of Toronto Press; London, Routledge and Kegan Paul).

Mulnix, J. W. & Mulnix, M. J. (2010) Using a Writing Portfolio Project to Teach Critical Thinking Skills, *Teaching Philosophy*, 33:1, pp. 27–54.

Nussbaum, M. (1997) *The Feminist Critique of Liberalism* (pamphlet: E.H. Lindley Lecture), University of Kansas, 1997. Repub. in A. Jeffries (ed.), *Women's Voices, Women's Rights: Oxford Amnesty Lectures 1996* (Boulder, CO, Westview Press, 1999).

Paul, R. & Elder, L. (2008) *The Miniature Guide to Critical Thinking*, 5th edn. (Dillon Beach, CA, Foundation for Critical Thinking Press).

Petress, K. (2004) Critical Thinking: An extended definition, *Education*, 124:3, pp. 461–466.

Phelan, A. (2001) The Death of a Child and the Birth of Practical Wisdom, *Studies in Philosophy and Education*, 20, pp. 41–55.

Plato (2003) *The Republic*, D. Lee, trans. (Harmondsworth, Penguin).

Pojman, L. P. (2003) Part 1—General Introduction: The Theory of Knowledge, in: *The Theory of Knowledge: Classical and Contemporary Readings*, 3rd edn. (2003) (Belmont, CA, Thomson Wadsworth).

Rudd, R. D. (2007) Defining Critical Thinking, *Techniques*, October, pp. 46–49.

Scriven, M. & Paul, R. (2008a) Defining Critical Thinking, *Foundation for Critical Thinking*. Available at: http://www.criticalthinking.org/aboutCT/definingCT.cfm

Scriven, M. & Paul, R. (2008b) Our Concept of Critical Thinking, *Foundation for Critical Thinking*. Available at: http://www.criticalthinking.org/aboutCT/ourConceptCT.cfm>

Thayer-Bacon, B. (1998) Transforming and Redescribing Critical Thinking: Constructive thinking, *Studies in Philosophy and Education* 17, pp. 123–148.

Van Gelder, T. (2005) Teaching Critical Thinking: Some lessons from cognitive science, *College Teaching*, 53, pp. 41–46.

Vaughn, L. (2005) *The Power of Critical Thinking: Effective reasoning about ordinary and extraordinary claims* (Oxford, Oxford University Press).

Willingham, D. T. (2007) Can Critical Thinking Be Taught?, *American Educator*, Summer, pp. 8–19.