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Commentary on "Why Not Teach Critical Thinking" by B. Hamby: Why Teach Critical Thinking

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1. Introduction

"Can critical thinking actually be taught?" asks Daniel Willingham (2007). His reply: "Decades of cognitive research point to a disappointing answer: not really" (p. 8). Many others are arriving at the same conclusion, including Benjamin Hamby (2016). But all is not gloom and doom come time to enhancing students' critical-thinking [CT] skills: Some ways of teaching CT seem destine to failure, and some obstacles to acquiring CT skills seem insurmountable, but some approaches to teaching and learning to think critically are demonstrably successful—a little.

2. The trouble with critical thinking across the curriculum

As popular as it still is, teaching CT "across the curriculum" [CTAC] has been more of an embarrassment than anything else. Evidence for the efficacy of CTAC would involve comparing the average gains in CT skills on the part of students from institutions *with* CTAC programs to those *without* such programs. And here the problems begin: Every university seems to be under the delusion that it somehow implements CTAC. At my university, for instance, CT was a category in the general education program, in which any department could offer courses. Since too many dance majors were unable to pass my CT course, that department designated one of its own courses as CT, saying that its students were "always thinking critically about their bodily movements." My university eventually made the CT category in its gen ed program gratis, claiming that *every* course it offers, *by its very nature,* is a CT course. (A reminder that consistency is *not* always a virtue.) At a California university I visited, the final moments of a literature course were spent finding the conclusion and premise in a paragraph handed out to the class, therewith meeting the CTAC requirement by doing "argument analysis." I'm sure you all have your own horror stories like these.

Delusional cases such as these aside, Huber and Kuncel (2015) find that "the literature is lacking any comprehensive comparison of [CTAC] programs to a more traditional college experience" (p. 4). After a meta-analysis of 71 studies of CT gains during students' four years of college, Huber and Kuncel confirm Arum and Roksa's (2011) finding of a .5 SD average gain. Using that as their control, they examined the CT gains in nursing programs, which are required to implement CTAC *within their departmental offerings—that* is as close as the available data come to approximating the necessary experiment across institutions. They, however, find that "nursing students simply did not improve more than their non-nursing counterparts" (Huber & Kuncel, 2015, p. 28).

Abrami, et al. (2008) find similar gains in their meta-analysis when looking at studies involving CT instruction that uses the "immersion" and "infusion" approaches, which are used in CTAC—immersion being instruction in specific subject matter with *no* explicit CT instruction, and infusion being regular specific subject-matter instruction *with* explicit CT instruction applied to that specific subject matter. Gains using immersion averaged .09 and gains using infusion averaged .54. Huber and Kuncel (2015) cite three studies involving the infusion approach in which there were gains in the domain-specific application of CT skills but *not* in domain-*general* CT skills (p. 29).

All this should come as no surprise—when the instructor has no expertise in CT, what else *could* one expect? Just as any nursing instructor would be appalled and insulted if we were to advocate the teaching of "nursing across the curriculum," so too should we be appalled and insulted by the ludicrous view that all nursing instructors, or all university faculty, are ready experts in CT and its instruction. Let us remember Richard Paul, et al.'s (1997) long list of observations detailing their surveyed faculty's ignorance regarding the nature and constituents of CT. That has been my experience too, in my three decades in academia. Faculty have no idea what CT is, or they have such a broad account that they are "experts" in CT by default: "*All* thinking is critical thinking," proudly proclaimed many of my self-esteemed colleagues. I have attended hundreds of committee meetings in my career and never did I leave without jotting down at least one new informal fallacy from a faculty member to share with my CT class.

The irony about Paul's disparagement of the average faculty member's expertise in CT is that he may well be partially responsible for the problem, as he made his career of holding CTAC workshops at many colleges, including mine. Perhaps training in his ultra-light-weight curriculum helped spawn faculty's unfounded confidence in their CT skills, as they were told that critical thinkers are "open-minded," and yet "have intellectual standards" and "make inferences logically follow from information," etc. (Paul & Elder, 2001). While these recommendations are correct, they are about as helpful as a financial advisor telling you to buy low and sell high.

When I say that faculty across the disciplines lack expertise in CT (and, therefore, can't seriously integrate CT instruction into their curriculum), I am *not* saying that they are *uneducable* in those skills. Don Hatcher (2013b) used faculty from across the curriculum to teach his university's three-semester dedicated CT program. The same curriculum (Hatcher & Spencer, 1993) was used by each instructor, and all instructors were well trained in it before teaching it. Hatcher (2016) used various CT pre/post assessment tests for his program, one of which was the *California Critical-Thinking Skills Test*. To see whether that test was too difficult for the students, he had the instructors take it, and none of them missed more than two of the 34 test questions (Hatcher, 2016). That was reasonable evidence of proficiency in CT skills among the instructors. But *their* training under Hatcher does *not* resemble what passes for "pedagogical grounding" in CTAC programs. [Abrami, et al. (2008, pp. 1119-21), find that instructor training in CT is very important in producing student gains in CT skills, as opposed to merely listing CT in one's course objectives or course description; unfortunately, none of their data supporting that finding involves college courses or programs.] I'll have more to say about Hatcher's CT program later, since, contrary to the way it is usually labeled, it is *not* an example of CTAC—simply using faculty from across the disciplines as instructors does not make a program an instance of CTAC.

Many have argued that CTAC is doomed to failure because there are no such things as *generic* CT skills that are teachable within and transferable across a diversity of disciplines— there are only domain-*specific* CT skills. (The three studies cited by Huber & Kuncel, 2015, p.

29.) appear to support this view, if confirmation bias is permitted.) This argument well never do, however. For instance, I think we can all agree that being able to correctly identify and use basic deductive argument forms is a handy CT skill, but, e.g., *modus ponens* is certainly subject-matter neutral.

Wellingham (2007) argues that there are no generic CT skills because they are not even *skills*, which imply "being able to use that skill anywhere" (p. 15). Since people aren't able to perfectly apply them across all subject matters, they are not skills, but only domain-specific "strategies." But this redefinist fallacy would mean that my ability to ride a bike is not a skill either, since I can't ride in a tornado or a swamp. One possesses a skill in *degrees*, and CT skills are no different. The degree to which they are possessed depends crucially on their transferability—the ability to apply them *across* subject matters.

And just because the wide-ranging application of a CT skill involves familiarity with those subject matters, that does not entail that the CT skill *itself* is unique to each of those subject matters. The trivial truth that "thinking is always thinking *about* a subject matter" has no implications about subject-specificity of CT skills. Take, for example, the CT skill of using arguments to the best explanation in scientific reasoning. Willingham (2007) believes that instruction in such argumentation is best left to the sciences: "Experts in teaching science recommend that scientific reasoning be taught in the context of such subject matter knowledge" (p. 16). Well, they *would* think that! But research and experience indicate otherwise: CT skills taught in subject-specific courses *stay* subject-specific in their application (again, Huber & Kuncel, 2015, p. 29). This is predictable: while scientists are quite good at *doing* science (within their own disciplines), they are usually mistaken about the *nature* of the scientific reasoning involved, and hence they are poor instructors of such reasoning. It's been my experience that most scientists adopt Karl Popper's account of scientific reasoning (one can never prove a hypothesis; one can only falsify it), which is not only wrongheaded but also a crude description of how scientific claims are to be justified. Richard Nisbett (2015, p. 261) shares these same observations. Moreover, in drawing the conclusion, for example, that I missed my bus, on the basis of the tandem tire tracks in the snow in front of my stop and the absence of my usual fellow riders, I reject alternative explanations of my evidence as I reason to my best explanation: the tracks weren't plausibly caused by another truck, since they can't park here, and the snow isn't enough to cancel service or keep people from their daily routines. I have used one of Wellingham's (2007) favorite "metacognitive strategies" (remember, he can't call it a CT 'skill') for scientific reasoning by appealing to my background knowledge (of course!), but *not* to knowledge I needed to get in the "rich context" of a science course. (And exactly *which* science course *would* that be, if Willingham were right, since *each* of the special sciences would have its *own* non-transferable domain-specific version of arguments to the best explanation and *none* involve vehicle tire tracks in snow?)

Now that I have discussed a legitimate problem plaguing the teaching of CTAC (and cleared away an illegitimate one), I want to discuss an often-cited obstacle to teaching and enhancing CT skills—cognitive biases.

3. I can't CT, but it's not you, it's me

The past decades have produced the most amazing research in cognitive and social psychology regarding how "predictably irrational" we are in our inferences, judgments, and decisions (Ariely, 2008). Our beliefs and values are biased, often based more on emotion than evidence, and

virtually unshakeable by counterevidence. For some wonderful discussions of this fascinating research, see, e.g., (Tavris & Aronson, 2007; Lehrer, 2010; Kahneman, 2011; Nisbett, 2015). The research on our cognitive biases is so robust that "If you're beginning to suspect that psychologists have a million of these, you wouldn't be far wrong" (Nisbett, 2015, p. 24). Recently, Don Hatcher (2016) has come to believe that our cognitive biases are a plausible primary explanation of the "paltry" gains in CT skills on the part of the students completing his impressive dedicated CT program at Baker University. Hatcher's program was truly admirable and substantive, involving a solid curriculum (Hatcher & Spence, 1993), taught in a two-semester introduction to CT skills, required of all first-year students, with an accent on the application of those CT skills in writing assignments, culminating in a senior-year capstone argumentative-writing project on public-policy issues. I consider Hatcher's program to have been the best effort at a basic-skills CT program to date, instantiating almost perfectly Ennis's ideal CTAC curriculum long before Ennis proposed it in (2013)—the main difference being that Hatcher wisely did not concentrate his efforts on integrating CT instruction into *all* curricula across the disciplines, for the same reasons I discussed earlier. But even with this, Hatcher achieved student effect-size gains on post-course CT assessment tests of approximately 1SD on the *Ennis-Weir CT Test* and only approximately .5 on the *California CT Skills Test* and the *Cornell CT Test Level Z*, over the program's 19 years (Hatcher, 2013a; 2013b). While these gains matched the gains it takes the average U.S. college graduate *four years* to achieve (Pascarella & Terenzini, 2005; Arum & Roksa, 2011), they are still tragically meager.

Hatcher's recommendation is for us to *lower our expectations*. Even when CT skills are taught by instructors *with* expertise in CT, the results will be modest, because the acquisition of more truth-conducive CT skills must first erode our pre-existing reasoning biases in order to replace them. Evolution and culture have had a *long* time to put those biases in place; we can't be expected to budge them easily and much. "One might think of it this way, if we were music teachers, we would expect that some students simply would not learn to play, most would play but not well, and only a few would learn to play well. So, we must learn to accept the reality that CT instruction is of limited value to large numbers of students" (Hatcher, 2016).

In light of this same wealth of research about our cognitive biases, Kenyon and Beaulac (2014) recommend that we give up trying to budge those biases from our minds and instead train our minds to "pre-emptively construct situations in order to minimize biases" (p. 349) and thus have our *actions* "nudged" (Thaler & Sunstein, 2009) towards rational results. The current "intuitive approach" of teaching students about cognitive biases abstractly, and subsequently expecting them to achieve "Level 2 debiasing," i.e., the ability to identify those biases and self-monitor so as to avoid them, is "practically impossible," according to Kenyon and Beaulac (2014, p. 354). Our merely being *told* that people are prone to biases is often countered by our "bias blind spot," viz, our tendency to think *we* are the unbiased *exception* (p. 346). So Kenyon and Beaulac (2014) advise that we adopt an alternative teaching method, viz., "not only teaching information about biases, but also teaching and ingraining the habits, skills and dispositions that facilitate adopting general reasoning and decision-making principles which nudge agents away from biased reasoning and filter its effects out of their actions," i.e., "Level 3 debiasing" (p. 349).

With this recommendation, however, four problems come to mind: First, after Kenyon and Beaulac (2014) complain that there is no evidence to support the efficacy of using the so-called "intuitive approach" of teaching debiasing, they admit that they have no evidence that *their* recommendation for teaching and promoting "Level 3 debiasing" is easier or more effective (p. 356). Second, "Level 3 debiasing" *presupposes* "Level 2 debiasing," in that one must identify

and self-monitor one's own biases, so as to control one's situation so as to remove triggers of them. So our authors have not so much offered a radical replacement approach to helping us surmount our cognitive biases, but rather a supplement to it. Third, often one can't change the environment to remove triggers of one's biases; one just has to guts it out and battle against those biases directly. And fourth, knowing about our biases, so as to avoid situations we know will likely trigger them, is of course important, but in route to making that point, Kenyon and Beaulac have been hacking away at a strawman, viz., what they called the "intuitive approach" to teaching debiasing. It is indeed an ineffectual way to correct learners' cognitive biases (viz., merely *telling* subjects "facts about biases"), but it is *not* the *only* way we teach debiasing nor the only way to teach CT skills in general, as the following research indicates.

Fong, Krantz, and Nisbett (1986) tested how training could improve peoples' statistical-reasoning skills concerning everyday situations. They focused on the CT skill of using the "law of large numbers," i.e., understanding how larger random samples are more representative of their source populations than smaller samples are and how increasing the size of a small sample will tend to get it to regress towards the actual proportions in the population. Our understanding of this rule is most accurately and easily applied to cases involving obviously *probabilistic* events or processes—for example, randomly selecting a sample of marbles from an urn. We have a more difficult time, however, applying this rule to measureable events involving *abilities*, such as athletic or academic performances—we are prone to the "fundamental attribution error" and are thus biased to form judgments about abilities on the basis of smaller samples than is truth-conducive. And we have even *more* difficulty applying the rule to events involving *traits*, such as friendliness and honesty. Here we settle for shamefully tiny samples (often only a single instance!) in forming judgments about people's character traits and future behavior on the basis of their past behavior, i.e., we are even *more* prone to the fundamental attribution bias. We need to debias, by "coding" situations and events more accurately in terms of their actual statistical bases (Nisbett, 2015, pp. 139-146).

One experimental group in Fong, et al.'s (1986) study received *abstract* training: subjects were introduced to the concepts surrounding the rule, and those concepts were then illustrated during a demonstration involving the selection of gumballs from an urn. Another group was given no such general introduction to the concepts; subjects were instead presented with three written *examples*, which they were told would give them "an idea of how broad the law of large numbers is" (Fong, et al., 1986, p. 260). Each example was followed by a question answered by means of an analysis in terms of the law of large numbers and its related concepts. All three examples were scenarios involving people's *abilities*. A third experimental group received *both* the abstract training and the three written examples. All subjects, including two control groups, were then given an 18-problem test consisting of scenarios—six each, concerning probabilistic events, abilities, and traits—each with questions that were best answered using an understanding of the law of large numbers and its implications.

Those receiving only abstract training or only exemplar training showed only slight improvement, while those receiving *both* types of training showed marked improvement. Interestingly, while subjects improved on all three domains of events—probabilistic, abilities, and traits—subjects still maintained the same *relative* degrees of bias with respect to them, indicating that these cognitive biases can be reduced but retain their respective durabilities.

In a second experiment, all three experimental groups received both abstract and exemplar training, the only difference being the domains of the examples used in each group—

probabilistic, abilities, or traits. This training again significantly improved subjects' statistical reasoning, and the particular domain of examples used in the training had no differential effect.

In a different set of studies, by Larrick, Morgan, and Nisbett (1990), two experimental groups received a half-hour training session explicitly on cost-benefit analysis and derivative principles about ignoring sunk costs (which we are biased not to do) and taking into account opportunity costs (which we are biased to ignore), with one group receiving financially based examples and the other group receiving non-financially based examples. Control groups received either no training or were advised simply to pay attention to future costs and benefits when making decisions. Subjects were then asked to state their decisions regarding various scenarios involving cost-benefit analysis. Larrick, et al. (1990) found that 1) explicit with exemplar training in cost-benefit analysis and these associated cognitive biases improves subjects' ability to make correct decisions, 2) such training is transferable and enduring across domains, and 3) merely alerting subjects to apply cost-benefit analysis does not improve subjects' decision-making abilities.

The results of these studies are perfectly in keeping with those of Abrami, et al. (2008, p. 1118): The *immersion* approach to CT instruction is virtually worthless at enhancing one's CT skills and the ability to apply those skills to everyday arguments and decision making. The mere *abstract* introduction to CT skills and cognitive biases, with no exemplary applications, is not much better (just as merely telling someone to "turn into the direction you're tipping" will not help them learn how to ride a bike). The *infusion* approach, in which domain-*specific* examples are understood using explicitly introduced CT skills, is significantly more effective (e.g., Solon, 2003). But the "mixed" approach is the *most* effective, which consists of a *dedicated* course (or portion of a course) that *explicitly* introduces CT skills, illustrates them with *examples*, and repeatedly *applies them to various and everyday domains*.

Two necessary conditions for effective CT instruction have become apparent in the discussion so far: 1) The subject-matter expertise of the instructor—that subject matter being CT! and 2) the method of instruction—transferable CT skills are best acquired by *explicitly* introducing and explaining CT skills, illustrating them by means of *examples* from various domains, and repeatedly applying them in *various* domains, i.e., practice, practice, and more practice at using one's CT skills.

But even seeing to these conditions, as did Hatcher—and as did I with my computer-assisted CT course (Possin, 2002), in which students had access to unlimited practice exercises, feedback, and exams so as to work to competency—gains in enhanced CT skills consistently peaked at 1 SD, as measured by a variety of credible CT assessment tests. *What is still keeping student gains from reaching escape velocity?*

4. Maybe it's the curriculum

According to Johnson and Blair (2009), what is keeping students from significantly enhancing their CT skills in dedicated CT courses is that the curricula used in those courses are so diverse that they amount to a "dog's breakfast." Indeed this is true to some degree by virtue of the alarmingly wide range in definitions of CT being implemented, e.g., when metacognitive thought about one's thoughts qualifies as CT. And, as Johnson and Blair point out, definitions of CT can err in the *other* direction and be too narrow, as when CT is equated with symbolic logic.

For them, CT "is plausibly thought of as skilled interpretation and evaluation of such intellectual products as observation reports and other kinds of information, explanations,

arguments, and so on….[T]eaching just one of these is by no means teaching all there is to learn about thinking critically" (Johnson & Blair, 2009, p. 3). They distinguish CT from informal logic, which they define as

> the normative study of argument. It is the area of logic which seeks to develop non-formal standards, criteria and procedures for the interpretation, evaluation and construction of arguments and argumentation used in natural language.… Informal logic is concerned with the logic of arguments used in argumentation: namely, the nature of the cogency of the support that reasons provide for the conclusions they are supposed to back up. (Johnson & Blair, 2009, p. 3)

Johnson and Blair also distinguish CT and informal logic from problem solving, decision making, and dialectical argumentation.

The problem, as they see it, is that all of these, along with deductive logic, inductive logic, and fallacy analysis, would reasonably serve as *separate courses*. The usual CT course, however, focuses on an "overly ambitious" array of these topics, giving them only "sketchy" coverage as a result (Johnson & Blair, 2009, pp. 4-5). Johnson and Blair leave us in a dilemma: Offer a dedicated course in CT, aligned with *their* definition, or expand into these other topics only to create a "sketchy" course.

As far as I can tell, however, the second horn of this dilemma is inevitable, *even for Johnson and Blair*. After being so insistent on their distinctions, they admit that the topics they have distinguished are "related" (Johnson & Blair, 2009, p. 4). Indeed! Evaluating arguments is impossible without understanding and using some normative criteria or conditions for cogency, and cogent argumentation is most usefully applied in one's decision making and problem solving, and is crucial if one is interested in pursuing truth and avoiding error in judgment, and informal fallacies are nothing but odd charges that make little sense without understanding *how* they are fallacious as the result of violations of the cogency conditions for good arguments, and "good arguments are responsive to objections, and sensitive to audience and occasion, as well as being embodiments of cogent reasoning" (Johnson & Blair, 2009, p. 4). And there we have it—*you can't do CT without the others*. That's why the curriculum of a *substantive* CT course is, *by nature*, "overly ambitious." Calling it "sketchy" for that, only blames the victim.

This might well be the missing explanation for why, even with the best instruction and a substantive CT curriculum, we still get unimpressive gains from students, as measured by general CT skills assessment tests. Is CT any different from any other subject matter in this respect, though? For example, how much can one learn in a well-taught, substantive, one- or two-semester-long undergraduate course on general *biology*? How much post-course gain would one expect with students taking, e.g., the *GRE Biology Test*? Some students might well achieve impressive gains, but most wouldn't, and some would even get worse, as Hatcher (2016) found with 30% of his students. Would that general biology course be "sketchy" for this?

And this is why I do *not* think we should abandon hope in our attempts to teach CT skills; we should merely join Hatcher (2016) in lowering our expectations. We have ample evidence as to how to improve the effectiveness of teaching and learning CT skills. As yet another example of this, I would cite (Rowe, et al., 2015), which discusses a general-education course at Sam Houston State University dedicated to enhancing scientific-reasoning skills and their application across the sciences and to everyday-life situations and public policy. Student gains in this course, as measured by the *Critical-Thinking Assessment Test* (which focuses solely on scientific

reasoning) have averaged .7. Again, while this is not extremely impressive, it is certainly better than the student gains in introductory geology, biology, physics, and chemistry courses which served as controls and averaged no gains at all. So even *narrowing* the CT curriculum and its assessment test like this does not hugely increase average gains—but it does increase them.

In light of the research indicating that cognitive maturation isn't on average complete until at least age 25, I'd *like* to blame neurophysiology for all this, but too much other research (e.g., Nisbett, 2015) prohibits me from doing so. As Nisbett (2015) himself admits:

> I violate most of the [CT] principles in this book frequently and many of them consistently. Some of our psychological tendencies [i.e., biases] are just very deep rooted, and they're not going to be extirpated by learning some new principles intended to reduce their untoward effects. But I know these tendencies can be modified, and their damage limited, by virtue of knowing about them and how to combat them. (p. 277)

So, teaching and learning CT is just like what George W. Bush said about "presidenting": "It's hard!" But the stakes are too high to not give it our best.

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