

Learning and Teaching Critical Thinking: From a Peircean Perspective

KELLEY WELLS

Evergreen Valley College, San Jose, California

Abstract

The article will argue that Charles Sanders Peirce's concepts of the 'Dynamics of Belief and Doubt', the 'Fixation of Belief' as well as 'habits of belief' taken together comprise a theory of learning. The 'dynamics of belief and doubt' are Peirce's explanation for the process of changing from one belief to another. Teaching, then, would be an attempt to control that process. Teaching critical thinking represents an attempt to teach the learner to regulate and discipline his or her own 'settlement of belief'. The 'settlement of belief' takes four different forms based on doubt. Peirce's concept of the 'habits of belief' refers to the inner and outer constraints placed both on belief as such and belief as it becomes action. The article may be read as both an exegesis of learning and as a pedagogical guide for teaching critical thinking to college students.

Keywords: belief, doubt, critical thinking, pedagogy, C. S. Peirce, theory of learning

1.

Before our examination of Peirce can begin it is necessary to make clear how we propose that his views be applied to the teaching of critical thinking.

Reasoning and Critical Thinking

Critical thinking (as a subject matter presented in a course) is not ordinarily considered to be 'philosophical' as such. How, then, can a particular philosophical approach, such as that of Peirce, become the centerpiece of a course without biasing it? By 'philosophical' we mean the sense in which the conception of what constitutes good critical thinking taken as a whole becomes a philosophical claim. Normally, good critical thinking is thought to be something basic, something common to or underlying all reasoning.

Given this view, a course in critical thinking is considered philosophically neutral. It is thought that its lessons enable the student to handle critical analysis without at the same time making a philosophical commitment to any particular system. One could, assuming this to be correct, use critical thinking equally well to defend or critique any philosophical view. In short, it has been argued that for the most part, the content of courses of critical thinking imply nothing beyond their own utility.

Ironically, the consequence of accepting this view of critical thinking is that the justification for the nature of critical thinking itself is not made. It is not only not made; it is thought to be entirely unnecessary. It is assumed to be *prima facie* self-evident, not in need of justification. Yet in our critical thinking classes the student is continually advised to examine the justification for claims. The concepts of objectivity, fact, value and reality are assumed without argument. Each of these notions is embedded in the content of critical thinking and is presented to the student as if they were uncontested philosophical issues. At the least it is important that the critical thinking student be made aware of these assumptions. So the answer to the question, ‘How can a particular philosophical approach become the centerpiece of a course in critical thinking without biasing it?’ is that it cannot.

Faculty Neutrality and Teaching Critical Thinking

In my experience most of the faculty teaching critical thinking believe that critical thinking can be taught without biasing it toward one particular perspective or other. What motivates this belief? Why do faculty tend to hold it rather than the opposite? The notion that critical thinking instructor can teach skills without imparting any political or philosophical prejudice validates the independence of the course and the instructor. These instructors are suggesting, without explicitly asserting it, that there is an objective science of critical thinking or of reasoning. But, as we will point out in a different context, this claim is itself philosophical and not merely pedagogical. The teacher taking this approach believes that reason can be studied as if it were a science. Since it is thought to be a science, it is by definition not philosophical—or so the thinking goes.

Other instructors recognize that it does at least have a cultural bias but believe that they are still able to present it in a balanced way. In the first case, however, the teacher is simply unaware that he or she is a philosopher in disguise. Later in the article we will show Peirce’s argument for scientific metaphysics. One may agree or disagree with Peirce. However it is impossible to separate the scientific method from fundamental epistemological and ontological questions. Even if we say that science makes no ontological claims (the anti-realist view), it is necessary to justify that position—which in turn becomes philosophically contested. In short it is logically inconsistent for some one to declare that since he or she is scientist, they are leaving philosophy to others. (Unfortunately, many do.)

In the second case, the teacher may be overrating his or her own pedagogical abilities or simply being intellectually dishonest. I have seen quite a few critical thinking instructors who think they are being balanced or fair when in fact they are not. Some think they are called to assume a political mission or crusade, yet at the same time believe they are being fair.

Objectives of Critical Thinking

What should be the objectives of a course in critical thinking? What do we hope that the critical student will achieve? In today’s educational environment, achievements are often measured in the form of ‘outcomes’.

Sometimes outcomes can be quantified; other times it is difficult. According to Bill Scroggins,

Student Learning Outcomes (SLO)s ‘operationalize’ course objectives, that is, state objectives in a manner that leads us more clearly toward how learning will be assessed.

- 1) State the objectives in terms of acquired knowledge, skill or values (usually the existing course objectives).
- 2) Add the context or conditions under which the student will be expected to apply the knowledge, skill or values.
- 3) State the criteria or primary traits that will be used in assessing student performance. (Scroggins, 2004)

When this metric is properly applied to a course in critical thinking, it tends to personalize it for the student, which is a good thing. An Outcome metric can be integrated into a description of the entire subject matter in action as a whole. Thus, it should not be thought of as a course that imparts individual skills or skills to individuals but rather encourages them to become (in the case of a course in critical thinking) the person who thinks critically.

The Critical Thinker

What does a good critical thinker look like? Any description of the critical thinker will include both explicit and implicit values. A number will relate to argument and/or debate. A critical thinker should be calm, reflective and careful thinker who is able to see his or her own position from others perspectives. A critical thinker will be able to identify formal and informal fallacies and will not commit or be influenced by them. He or she understands the standards of good argument and is able to distinguish good from bad reasoning. He or she will recognize the influence of advertising and propaganda. The critical thinker acknowledges that learning to improve thinking includes social responsibilities. In a republic, the political process is a conversation—whether private or public, whether between individuals or across the nation. The critical thinker should bring a voice of reason to this discussion. This is something the critical thinker *ought* to do, meaning that critical thinking has a moral as well as strictly intellectual dimension.

First of all, the decision to teach critical thinking and apply the above system of values entails that the individual and presumably society as a whole will be the better for doing so. In other words, society will be better off because of this course and its content. While this may be obvious, it contradicts the position that critical thinking skills are value neutral. Taking critical thinking is better than not taking critical thinking and the skills contained within the course are directed toward a social good.

Second, the portrait of the critical thinker is not merely descriptive, but *culturally prescriptive*. Not coincidentally they are the values of modern western countries. They challenge the cultural norms of a closed and less tolerant society. Thus critical thinking as it is usually taught reflects the influence of a secular western social order.

Finally, this undermines any pretense of cultural relativism. Cultural relativism states that each culture is unique and that it is intolerant to judge one culture by the standards of another. However when we impose the Western European values of critical thinking on other cultures, that is precisely what we do. We are asserting that western reason and tolerance are superior to all others and especially those that are less secular or more apparently dogmatic and intolerant. The upshot is that the critical thinker looks just like a calm, reflective, active, secular participant in a modern western democracy. The Peircean ‘Theory of Learning,’ describes an individual in this context. Moreover, this individual could represent a challenge to a more conservative culture.

Clearly this is a goal, unstated or not, of teaching critical thinking. If we don’t like this goal, we need to redesign the course. But any discussion about this is a discussion of the *philosophy* of a critical thinking course.

To summarize: any treatment of critical thinking will of necessity carry philosophical implications. It would be intellectually dishonest to pretend otherwise. Moreover, the position in which critical thinking is posed as philosophically neutral—bereft of ethical and ontological implications—is not a philosophically neutral position. Ironically, to claim that it is possible to critically think independently of philosophy is itself a philosophic stance. Such a view implies that the standards for what divides fallacious from appropriate inference require no justification.

2.

Peirce’s Learning Theory: The Dynamic of Belief and Doubt

Beliefs, for Peirce, exist within a dynamic framework and are not static. To remain stable they must be continuously supported by an act of the will. In other words, beliefs are not something that we have, but something that we do. When the ‘Dynamic of Belief and Doubt’ is combined with Peirce’s ‘Fixation of Belief’ and ‘habits of belief,’ we have a robust explanation for why some beliefs are resistant to change while others are not. Taken together they provide the basis for a learning theory. This is because the most obvious outward manifestation of knowledge is a belief. In the most general sense, learning is a kind of belief change. What is a belief?

According to Peirce a belief:

... is the demi-cadence which closes a musical phrase in the symphony of our intellectual life. We have seen that it has just three properties: First, it is something that we are aware of; second, it appeases the irritation of doubt; and, third, it involves the establishment in our nature of a rule of action, or, say for short, a habit. As it appeases their irritation or doubt, which is the motive for thinking, thought relaxes, and comes to rest for a moment when belief is reached. But, since belief is a rule for action, the application of which involves further doubt and further thought, at the

same time that it is a stopping place, it is also a new starting-place for thought. That is why I have permitted myself to call it thought at rest, although thought is essentially an action. The final upshot of thinking is the exercise of volition, and of this thought no longer forms a part; but belief is only a stadium of mental action, an effect upon our nature due to thought, which will influence future thinking. (Peirce, 1878)

Here Peirce ties together the concepts of belief as comfort, doubt as irritation and belief as the establishment of a rule for action—a habit of belief. We think of learning as something that causes a change in belief—but based on knowledge, fact or reason. Learning can come as a result of many other valid reasons, such as art, religion and therapy. It can come as a result of personal transformation, such as through a recovery group or mystical experience. It can come as a result of tragedy, disease and death. As a consequence learning can be very deep and difficult to measure. But in the end it is reducible to changes in beliefs and the actions or expectations that flow from those new beliefs. Learning can be defined in many ways but the definition of belief given above would capture it in its most sweeping form.

According to Peirce, thought and its meaning can be understood as follows:

If there be a unity among our sensations which has no reference to how we shall act on a given occasion, as when we listen to a piece of music, why we do not call that thinking. To develop its meaning, we have, therefore, simply to determine what habits it produces, for what a thing means is simply what habits it involves. Now, the identity of a habit depends on how it might lead us to act, not merely under such circumstances as are likely to arise, but under such as might possibly occur, no matter how improbable they may be. What the habit is depends on when and how it causes us to act. As for the when, every stimulus to action is derived from perception; as for the how, every purpose of action is to produce some sensible result. Thus, we come down to what is tangible and conceivably practical, as the root of every real distinction of thought, no matter how subtle it may be; and there is no distinction of meaning so fine as to consist in anything but a possible difference of practice. (Peirce, 1878)

When we consider something we ‘develop its meaning’ as we grasp the range of habits associated with it. Further, one’s evolving beliefs about it and their meanings should correspond. (Adjusting belief and meaning to conform constitute learning.) We can know if learning has occurred by *measuring actual or potential changes in habits of action* that define the meaning of the belief. So a change in attitude or expectation could constitute learning equally as much as an action. But the focus of the article is limited to critical thinking. We hope to show how Peirce’s theory of learning contributes to our understanding of critical thinking. Further, because we are able to grasp its nature, we should become more effective instructors. Even though we have this more modest goal, however, the article taken as a whole can be read as an application of Peircean learning theory.

According to the dynamic of belief and doubt, Peirce explains that belief is not simply an opinion, but a state of mind that opposes doubt. He says, doubt is an uneasy and dissatisfied state from which we struggle to free ourselves and pass into the state of belief; while the latter is a calm and satisfactory state that we do not wish to avoid, or to change to a belief in anything else. On the contrary, we cling tenaciously, not merely to believing, but to believing just what we do believe.

Thus, both doubt and belief have positive effects upon us, though very different ones. Belief does not make us act at once, but puts us into such a condition that we shall behave in some certain way, when the occasion arises. Doubt has not the least such active effect, but stimulates us to inquiry until it is destroyed.

Belief and doubt have an opposing relationship with each other. Belief is habitual because it is comfortable: we like to believe. Doubt, on the other hand, is caused by surprise or the contradiction of belief. It is irritating or uncomfortable. It provokes inquiry or investigation. We are motivated to return to belief—to return to comfort. Doubt creates the need to make an adjustment in our beliefs. The crucial question is *how* we return to comfort or new belief.

But doubt is so unpleasant that it may cause us to seek any belief that will return us to comfort. We may be inclined to accept any answer no matter how suspect, just to end the irritation of doubt. And once we think we have the answer, why continue looking for one? There is no need for further inquiry. The great danger of any belief is that it terminates inquiry. For Peirce, the opportunity for critical thinking begins with the creation of doubt. Critical thinking occurs within the process of returning from doubt to the new belief.

However, doubt does not necessarily cause critical thinking to occur. In order to know why this is the case we will need to understand the nature and function of belief.

It is reasonable to assume that in general, a longer inquiry is better than a short one. The sooner we resolve doubt into belief the less likely the belief will survive critical examination. So as a rule of thumb, the longer we are able to leave a doubt unresolved—the greater our toleration for the irritation of doubt—the more likely its ultimate resolution will withstand thorough analysis. Critical thinking is made possible by learning to tolerate longer and longer intervals of the irritation of doubt.

The Fixation of Belief

But in order to produce superior critical thinking, prospective beliefs must be exposed to intense as well as lengthy examination. Obviously it would make the most sense for the critical thinker, then, to practice intense and lengthy examination of his or her own prospective beliefs. He or she would need to formulate a way of solidifying belief or beliefs that incorporate these elements as best practices. Best practices should ensure the greatest probability for successful reasoning. In fact, it is the methodology of resolving doubt we adopt (or the best practices themselves) that establishes the reliability of our critical thinking. In other words, how we choose to settle belief determines the quality of our critical thinking.

Another of Peirce's most famous papers was published in 1877 and is entitled, 'The Fixation of Belief'. By 'fixation', he does not mean the repair of a belief. Nor does he mean being 'fixated (stuck on)' a belief. What he means by 'fixation' is the 'affixing or putting into place' of a belief. In other words, how do we arrive at or how do we come to believe what we believe.

According to Peirce, there are four methods of 'fixing' belief,

- a) tenacity
- b) authority
- c) *a priority*
- d) the scientific.

In the method of *tenacity*, a belief is held by a sheer act of will. Contrary evidence is rejected without any consideration. Peirce says,

If the settlement of opinion is the sole object of inquiry, and if belief is of the nature of a habit, why should we not attain the desired end, by taking as answer to a question any we may fancy, and constantly reiterating it to ourselves, dwelling on all which may conduce to that belief, and learning to turn with contempt and hatred from anything that might disturb it? This simple and direct method is really pursued by many men ... The man feels that, if he only holds to his belief without wavering, it will be entirely satisfactory. Nor can it be denied that a steady and immovable faith yields great peace of mind. (Peirce, 1877)

We stand in need of an example.

Tenacity

Thuy is a student in Philosophy 060 (Critical Thinking). She gets a 100% on her first quiz. Therefore she is comfortable with the belief that Philosophy 060 will be an easy 'A' and looks forward to finishing the class. Then Thuy gets a 50% on her second quiz! She now doubts the belief that she would get an 'A' in the class. She quickly passes through a brief but intense state of irritation by means of a faux inquiry. Since she almost always get 'A's, she concludes that the course must be too hard. Without further reflection she decides to drop the class. She has discussed her decision with neither fellow students nor the Professor, nor any one at all. Her mind is made up. This method of 'fixing belief' or belief resolution is *tenacity* because Thuy clings to an *inflexible* belief. She simply refers back to the belief that she had already held, namely that she almost always gets 'As' and that any course threatening that belief must be too hard, 'constantly reiterating it to' herself.

Authority

Tenacity runs into difficulties, however. The tenacious believer can and will encounter an equally tenacious individual with opposite beliefs. Thuy's father tells her she

must take the class. His view is no less tenacious than Thuy's certainty that she should drop Philosophy 060. How, then, can the conflict of two equally tenacious individuals be resolved? Peirce tells us that it is accomplished through community tenacity or *Authority*.

Let the will of the state act, then, instead of that of the individual. Let an institution be created which shall have for its object to keep correct doctrines before the attention of the people, to reiterate them perpetually, and to teach them to the young; having at the same time power to prevent contrary doctrines from being taught, advocated, or expressed. Let all possible causes of a change of mind be removed from men's apprehensions. Let them be kept ignorant, lest they should learn of some reason to think otherwise than they do. Let their passions be enlisted, so that they may regard private and unusual opinions with hatred and horror. Then, let all men who reject the established belief be terrified into silence. Let the people turn out and tar-and-feather such men, or let inquisitions be made into the manner of thinking of suspected persons, and when they are found guilty of forbidden beliefs, let them be subjected to some signal punishment. When complete agreement could not otherwise be reached, a general massacre of all who have not thought in a certain way has proved a very effective means of settling opinion in a country. (Peirce, 1877)

Using the same example, Thuy gets 100% on the first quiz followed by 50% on the second. She now has doubt about the belief that she will get an 'A' in Philosophy 060. Doubt causes inquiry. But this time Thuy's belief resolution is brought about by an external agency. Her father's demand that she continue in the class becomes an expression of the authority of her family. Thus, Thuy believes she must stay in class in order to respect the wishes of her family.

In addition to the family, more brutal institutional authorities, such as church, state, nation or military have been throughout history the most dominant methods of fixing belief. For thousands of years' nations, societies, cultures and religions have been maintained by force. Even today *Authority* continues to be the principal means by mankind to resolve doubt.

Another *Authority* is the peer group or friends. This time Thuy's inquiry is to ask her classmates what they got on the second quiz. Most got 60 and 70% while a few got 80 and 90%. They tell her the quiz was too hard.

Therefore, her new belief becomes that it was OK for her to get a 50%. She decides to stay in the class. Her peers are the external agency.

A Priority

In the third example, the situation is identical with the first two. Again, doubt is created in Thuy because she got a 50% on her second quiz. This time Thuy chooses a resolution that appears to involve more reasoning and can seem to be critical thinking. But the reasoning is not based on evidence.

It is directed toward a pre-determined outcome. They may be afraid of failure and be looking for a reason to drop the course. Here, the reasoning is aimed at that outcome and does not reach a conclusion based on evidence.

This sort of doubt resolution or fixation of belief has a conclusion already foreordained. This method is called *A Priority*. Peirce says,

They [*A Priority* beliefs] have been chiefly adopted because their fundamental propositions seemed agreeable to reason. (Peirce, 1877)

This is an apt expression; it does not mean that which agrees with experience, but that which we find ourselves inclined to believe.

They is *inclined* to get out of the class. While an 'F' on one quiz is hardly sufficient evidence to justify dropping it, she concludes to drop it.

The individual using the method of *A Priority* can see their concept or what appears 'agreeable to reason' slip through their fingers as well. Peirce continues:

Many a man has cherished for years as his hobby some vague shadow of an idea, too meaningless to be positively false; he has, nevertheless, passionately loved it, has made it his companion by day and by night, and has given to it his strength and his life, leaving all other occupations for its sake, and in short has lived with it and for it, until it has become, as it were, flesh of his flesh and bone of his bone; and then he has waked up some bright morning to find it gone, clean vanished away like the beautiful Melusina of the fable, and the essence of his life gone with it. (Peirce, 1878)

The Scientific (Critical Thinking)

The fourth and final type of doubt resolution is true critical thinking. They begins her inquiry considering the fact that she got a 50% on the most recent quiz. She thinks about how carefully she read the assigned material. She thinks about how well she understood the classroom lectures. She takes into account the scores of her friends and their comments. Although she is not quite ready to have an individual meeting with the instructor, she thinks she might if she has to. It is still early in the semester. She decides that the best decision, the best way to terminate doubt is to stay in class and wait and see.

She still has time to drop the class. Therefore the most disciplined resolution of doubt is to prevent it or to maintain doubt. In short she decides to keep an open mind. This can be extremely difficult.

Peirce calls this the *Scientific*. His description of this method of fixing belief addresses some additional issues. When most of us think of science and the scientific method, we think of objectivity. And this is correct. Peirce is saying that in the scientific method 'may be determined by nothing human, but by some external permanency—by something upon which our thinking has no effect.'

To be objective requires that it would affect[s], or might affect, every man. And, though these affections are necessarily as various as are

individual conditions, yet the method must be such that the ultimate conclusion of every man shall be the same. To satisfy our doubts, therefore, it is necessary that a method should be found by which our beliefs may be determined by nothing human, but by some external permanency by something upon which our thinking has no effect. Some mystics imagine that they have such a method in a private inspiration from on high. But that is only a form of the method of tenacity, in which the conception of truth as something public is not yet developed. Our external permanency would not be external, in our sense, if it was restricted in its influence to one individual. It must be something which affects, or might affect, every man. And, though these affections are necessarily as various as are individual conditions, yet the method must be such that the ultimate conclusion of every man shall be the same. Such is the method of science. Its fundamental hypothesis, restated in more familiar language, is this: There are Real things, whose characters are entirely independent of our opinions about them; those Reals affect our senses according to regular laws, and, though our sensations are as different as are our relations to the objects, yet, by taking advantage of the laws of perception, we can ascertain by reasoning how things really and truly are; and any man, if he have sufficient experience and he reason enough about it, will be led to the one True conclusion. The new conception here involved is that of Reality. (Peirce, 1877)

Clearly, Peirce is not only describing a method of fixing belief but identifying the conditions necessary for it to be possible. He believes that there must be a real world independent of our mind(s) where observations can be verified. Peirce is a scientific realist—a view not shared by many contemporary philosophers of science. Thus Peircean learning theory based on Pragmatism and his philosophy of science acknowledges its ontology and beyond that, that science (and learning theory) has a philosophical dimension. Even though there may be subjective differences between our sensations, the laws by which we sense and reason make it possible for their validation. This is the origin of Peirce's notion of the 'community of inquiry.' However, there is a tension between the 'Reals' which affect our sensation and 'the one true conclusion'. It may be that the 'Reals' aren't really real after all. They may be only steps in the scientific dialectic leading toward the 'one True conclusion.' Then the question naturally arises, 'Is reality the 'Reals' or 'the one True conclusion'? It is likely that the two may not agree with each other. In fact, if we have yet to reach 'the one True conclusion', and 'the one True conclusion' is reality, then all scientific claims fall short of reality. Scientific realism has foundered on this difficulty—causing some to adopt the anti-realist view.

A lot of discussion of this issue has gone on among Peirce scholars. In the end it is unclear whether Peirce achieves a resolution of this dilemma. His thoughts on the question are scattered throughout his writings and do not appear to maintain a consistent position on the issue—a problem identified by Peirce scholars as 'the long run of inquiry'. And some would argue, like the anti-realists, that a resolution is not possible.

3.

The Abstraction of a Theory of Learning from Peirce

Peirce's dynamics of belief and doubt and four methods of fixing belief were intended to be much more than simply a theory of learning and a methodology for understanding and teaching critical thinking. They are seminal writings in what was at the time was the novel and uniquely American philosophy of Pragmatism. Peirce later called it Pragmaticism because he was objecting to James' Kantian or constructivist reading of his writings. Peirce was a thoroughgoing realist and insisted that his creation was Aristotelian if not Scotistic realism. So upset was Peirce he decided to rename his philosophy Pragmaticism, 'a name so ugly no one would steal it.'

Peirce's thrust is broad and philosophical. Ours is narrow and pedagogical. The objective of this article is simply the application of the dynamics of belief and doubt and methods of fixing belief to the pedagogy of critical thinking. We maintain that they constitute an ideal platform for our educational purposes. The Peircean psychology of belief makes explicit requirements for learning left implicit or often entirely unmet in current approaches to teaching critical thinking. This is because it presents a clear picture of the formation of beliefs and how they are changed, making it possible to see fallacious reasoning in the broader context of poor doubt management.

As the student comprehends this picture, he actually learns the forces at play within critical thinking. Good and bad thinking will trace the contours of belief and doubt. Rather than being taught critical thinking as a series of apparently disconnected rules, critical thinking can be presented as a subject possessing clear relationships. As will be discussed later, good critical thinking usually occurs when the new belief followed upon well-managed doubt. Well managed doubt is doubt that was not terminated prematurely and was kept alive long enough for sufficient inquiry to occur. The 'cash value' of the 'rules' of critical thinking, both formal and informal, is their impact on the management of doubt.

Teaching the Rules of Critical Thinking

Normally, once the student learns a particular rule of formal logic or an informal fallacy he or she is taken to the next. This understanding of critical thinking conceives of it as a collection of unrelated individual principles.

Each has the role of preventing different kinds of errors in reasoning. But the larger picture is ignored or over looked.

Why, then, do many students acquire the ability to display the outward facade of critical thinking, but lose it soon thereafter? At the end of the term (if not even during the term) poor thinking habits return.

This is for three reasons:

- a) Students are not asked to think critically within an emotion rich context;
- b) Their public reasoning does not truly reflect their private reasoning;
- c) Critical thinking is difficult to measure.

In this article we will address only 'a' and 'b'. 'a' has several components.

Critical thinking texts often include a component of formal logic. Many contain Aristotle's 'Square of Opposition', Venn diagrams and 'Truth Tables'. In addition, fundamental laws or principles of formal logic such as *modus ponens* and *modus tollens* are taught. *Modus ponens* and *modus tollens* are two forms of argument. The hope is that once the student understands these forms, they will by analogy recognize numerous embedded examples.

Let's take a look at *modus tollens*:

p q
Not q
Not p

'p' is necessarily related to 'q'. Therefore to deny 'q' is to deny 'p'. Any argument reflecting the above is logical or valid.

A very similar but invalid form of argument is affirming the consequent.

If p q
q
p

An argument having this structure is invalid. Just because 'p' leads to 'q', does not mean that 'q' cannot be without 'p'.

So we have a formal rule of logic, symbolized for maximum generalization.

If we deny the consequent we deny the antecedent. But if we affirm the consequent we are not required to affirm the antecedent. This is slippery stuff and most of my students would look at it with stone faces. A few would memorize it, giving the appearance of critical thinking on exams.

This can be more meaningfully taught through examples. Suppose students are presented with this information: If enough young people vote a proposition allowing people to drive motorcycles without helmets will pass.

Based on that, the argument:

Enough young people voted.
The proposition allowing people to drive
motorcycles without helmets passed

is made.

And then this argument:

The proposition allowing people to drive motorcycles without helmets did
not pass.
Not enough young people voted

is proposed. If they were given the first argument, most would see the relationship between premise and conclusion. If not enough young people were to vote then the proposition allowing people to drive motorcycles without helmets would not pass. *Modus tollens* however, as an abstraction or logical generalization, would be completely unknown, unless it was taught as an application of the argument.

Continuing with the above argument,

The proposition allowing people to drive motorcycles without helmets did pass.

Therefore, enough young people voted.

Many students would agree that this argument followed as well. But obviously, the proposition might have passed without the assistance of young voters, making this argument invalid. Attempting to have students learn in symbolic form the distinction between *modus tollens* and *affirming the consequent* increases the difficulty considerably. The explanation of the concrete incident is easily understood, while the distinction between *modus tollens*-denying the consequent (valid) and affirming the consequent (invalid) is slippery. Even if the distinction is grasped, the application must be carefully made. It is much easier to discuss it in the context of a concrete example than teach the formal principle and then correctly apply it. A careful discussion of the causal relationship between 'student voting and allowing people to drive motorcycles without helmets will pass' will reveal the difference between denying and affirming the consequent.

Students would be informed that there is a particular relationship between antecedent and consequent called *modus tollens* embedded in the first argument. When an argument assumes this form, it is always valid.

Likewise when the antecedent and consequent of an argument are sequenced as in the second it is called *affirming the consequent* and is always a fallacy. From this, the student would be expected to recognize both *modus tollens* and *affirming the consequent* when encountering them. But parsing the relations between antecedent and consequent in an argument requires that the logic or illogic of argument be comprehended in the first place.

What is the utility of formal logic in a critical thinking course? In terms of the dynamics of belief and doubt, symbolic logic has very little power to generate and resolve meaningful doubt. Learning formal logic is an ineffective tool of problem solving, except for problems expressly designed for the application of symbolic logic. Understanding how to do this correctly may be more difficult than solving the problem itself.

Informal Fallacies

This recognition is not new. Many critical thinking texts have largely deemphasized formal logic precisely for the reasons given.

In order to overcome this difficulty, *more relevant* critical thinking texts have been written. These books de-emphasized formal logic and emphasized informal fallacies in the context of political, social, ethnic, racial and cultural issues. It was thought that learning the informal fallacies committed in highly emotional contexts would present a more realistic way for students to encounter them. Of course, this is undoubtedly true. But often the best the students can grasp from these revelations is the particulars of each. For many the underlying 'habits of belief' that are the source of the particular fallacy remains unaddressed.

However, the rules of informal fallacies have been substituted for the formal principles of logic. Informal fallacies are mistakes in reasoning that are not just equivalent to someone cheating at chess. They are more like someone who overturns the chessboard. And like errors in formal logic, they are so common that they have been given names. This is so that they will be acknowledged when used by others or themselves. The goal, of course, is to improve critical thinking.

Examples of informal fallacies include *ad hominem*—literally ‘to the man’, and Straw Man. In the *ad hominem* fallacy, the individual making the argument is attacked rather than the argument itself. In the Straw Man fallacy, one distorts his or her opposing argument, making it appear ridiculous. Fallacies are used within debates, usually to take control of the argument by forcing it to an illegitimate conclusion. The fear of being shown up or exposed to the irritation of doubt is terminated. In other words, in the back and forth of an argument, informal fallacies are commonly provoked when person ‘A’ is confronted with an argument from person ‘B’ that severely challenges ‘A’s’ position. If ‘A’ has no ready reply he or she may be tempted to use a fallacious response.

The generation of fallacies can be understood clearly in the context of the dynamics of belief and doubt. Remember, external debate takes place between two conflicting systems over the substrate of ‘habits of belief’.

Then ‘B’ causes ‘A’ to doubt one of his or her habits of belief. ‘A’ is irritated and at the same time has little tolerance for doubt. So ‘A’ may be inclined to not take the time to give a thoughtful reply. Informal fallacies are a way to rapidly terminate doubt.

This suggests that to reduce the use of informal fallacies two corrective approaches should be taken at the same time. The first is to become familiar with them. Knowing informal fallacies will enable critical thinkers to point them out when used against them. In addition, knowing them may inhibit their use when one is tempted to employ them. The second is to increase the tolerance for doubt. Each fallacy needs to be understood, then, not as some separate error in reasoning, but as part of a more general pattern of the dynamics of belief and doubt. In Peirce’s terminology they represent illegitimate methods of terminating doubt. They are argument ‘closers’ or fraudulent ways to end argumentative exposure. Informal fallacies are not driven by particular logical errors but by the inability to withstand doubt in general ways. They are best understood and overcome by grouping them in the appropriate method of establishing belief that generates them. Once informal fallacies are seen to fall into these dynamic patterns of belief and doubt rather than as a loose collection of unrelated errors, it becomes realistically possible to end committing them.

This is because the motivation to resist change is coming internally rather than externally. Fallacies are a symptom of the inability to withstand doubt, not the cause.

In order to avoid committing fallacies the individual must address the underlying problem with doubt. Until that problem is addressed, no amount of instruction in the external identification of fallacies will lead to significant improvement in critical thinking.

The conventional way to teach fallacies has been to give students examples and identify the general rule they each represent. The hope is that students will learn

to identify them and consequently be uninfluenced by them. In addition it is thought that this will cause students not to use informal fallacies themselves. Having been taught the *ad hominem* and Straw Man fallacies, the student would be immune to them. My experience suggests otherwise, however. The very same students who can correctly answer test questions on informal fallacies will continue to commit them.

The methodology of teaching informal fallacies is nearly identical to the one used to teach formal logic. Like learning logic, it is a 'rules based' approach.

The student is introduced to a rule or principle, then given an example or examples and expected to identify them. The belief is that when exposed, they will be uninfluenced and unwilling to employ them. But this approach fails for much the same reason that our formal logic pedagogy failed—the principle or rule never altered the students '*habits of belief*'.

Habits of Belief

We have now come again to 'habits of belief.' As Peirce said in 'How To Make Our Ideas Clear', a habit of belief 'involves the establishment in our nature of a rule of action, or, say for short, a habit.' A habit of belief can be both public and private. They are public in the sense that they are the actions taken as a consequence of a belief. These are considered habits of belief if the belief and subsequent action are habitually associated. These actions are disclosed or communicated to others. *An outer habit of belief can take the form of an argument as well.* Habits of belief can also be private in the sense that they represent patterns of thought or belief that are not exposed to others but are at the same time habitual in nature. Feelings, thoughts, beliefs that occur and reoccur in regular ways are private or 'inner' habits of belief. Beliefs that produce external communication or action or that is exposed to others are outer habits of belief. While all habits of belief are difficult to change, inner habits of belief are the most difficult to change because they are purposefully made the most inaccessible. They are intentionally protected, because they are the habits of belief that are held most dear.

Critical thinking occurs in the mix of inner and outer habits of belief with the inner most often motivating the outer. In addition it is enveloped and constrained by a social and cultural world that has itself been created by community habits of belief. In order for improved critical thinking to be long lasting, it must recognize these realities. Peirce says,

Every sane person lives in a double world, the outer and the inner, the world of percepts and the world of fancies. [By 'fancies' Peirce means voluntary thoughts while 'percepts' are involuntary feelings with accompanying physical reactions that can sometimes be suppressed.] A man can be durably affected by his percepts and his fancies. The way in which they affect him will be apt to depend upon his personal inborn dispositions and upon his habits. Habits differ from dispositions in having been acquired as consequences of the principle ... that multiple reiterated

behavior of the same kind, under similar combinations of percepts and fancies, produces a tendency—the *habit*—actually to behave in a similar way under similar circumstances in the future. Moreover—*here is the point*—every man exercises more or less control over himself by modifying his own habits; and the way in which he goes to work to bring this effect about in those cases in which circumstances will not permit him to practice reiterations of the desired kind of conduct in the outer world shows that ... *reiterations in the inner world—fancied reiterations—if well intensified by direct effort, produce habits, just as do reiterations in the outer world; and these habits will have power to influence actual behavior in the outer world; especially, if each reiterations be accompanied by a peculiar strong effort that is usually likened to issuing a command to one's future self.* (Peirce, 1934)

Here Peirce is discussing the interrelationship between the outer and inner world. The internal world can finally affect the outer world through the production of habits—habits that alter external behavior. Internal reiterations—emerge as habits of thinking. Habits of belief are commands to ‘one’s future self,’ meaning habits of belief direct and shape external thinking by ‘reiterations in the inner world.’ This internal thinking has the goal of affecting external argument (as well as behavior).

Teaching Doubt Management

In order to help discover this relationship the student should be exposed to the habits or associations, what one might describe as ‘proto-arguments’, unfolding within the inner world. These associations represent the primitive versions of what later become expressed as arguments in the outer world.

We are referring here to significant arguments—where issues really matter.

Bad reasoning can be the outcome of emotional difficulties—unresolved or unbalanced issues with belief and doubt. Peirce’s commentary suggests that change and reiteration, not *suppression*, is how the inner can influence the outer. Moreover while the dynamical relationship embedded in the ‘double world’ *may* unfold, it will not necessarily produce an argument capable of withstanding public scrutiny. Hence the root of bad external reasoning could lie in internal questions of the method of establishing belief and the tolerance for doubt and not in analysis of the mistake per se. We can inform the student’s analytical skills but he or she will not necessarily apply them in the areas where the habits lead to an excessive fear of doubt.

The inability to tolerate doubt, as we saw in the four methods of fixing belief, lead to Tenacity, Authority and *A Priority*. Beliefs based on Tenacity fall outside of analysis. Why is x believed? Because x is believed. In the dynamic of belief-doubt-belief, doubt is not terminated. It is eliminated. One can only imagine the enormous fear that must drive a person to adopt this method. A reason why Tenacity is effective is it replaces the premise conclusion structure of argument with that of a focused or directed belief. This makes it relatively easy to convert the tenacious

belief into a premise for which the only possible conclusion is action. This is because the tenacious belief thought of as a conclusion is immune to argument and therefore free to become the premise or justification for any action.

Argument has been replaced by action. Wars have been justified on premises that were themselves tenacious beliefs. This also explains why it becomes so difficult for many to apply higher standards of argument to questions of war and peace. The habits of belief regarding war represent the controlled thrust of belief propelling action, modeling the controlled thrust of the bayonet into the enemy. Some will seek authority as a method to resolve doubt. Peirce, as was explained, conceived of the method of authority as distributed tenacity possessing uniform views. The habits of belief generated in this way do manage to entertain doubt in contrast to the method of tenacity that, in contrast, do not. Why is x believed? Because y says to believe it. Doubt is permitted until taken control of by the authority. Returning to the example of the justification for a war, it is understood that a war requires something beyond a claim that is able to act as a conclusion and premise simultaneously. To apply an analytical approach against this method of fixing belief will fail, however, unless it is able to address the question of doubt itself and not merely the merits of the argument based on it. The motivation for people to accept such poor arguments from authority is the demands of doubt. Doubt is too difficult to tolerate long enough for critical thinking to begin.

A Priority is a *priori* beliefs both beginning and ending the dynamic of belief and doubt. Doubt is managed by what seems 'agreeable to reason'.

It is a methodology that contains the appearance of open inquiry but contains and regulates the termination of doubt. The regulation is accomplished by reason but it is reason devoid of experience and targeted toward a predetermined goal. In philosophy examples include proofs for the existence of God and other arguments having theological destinations. On the other hand, contemporary anti-metaphysical arguments suffer from similar defects. The critical thinking student may have beliefs that slide in either direction or have made basic decisions in their life and have 'rationalized' them in the same way. For example, a student has decided to quit college and go to work. They are asked why they chose to do that. They answer, 'I need to support my family.' But upon further investigation it is discovered that they are eligible for financial aid. But then they still decide to quit school. 'Why?' we ask. They do not have enough time to spend with their family, they answer. But that obstacle can be met as well. The student continues to resist. It is clear that he or she is determined to quit school and will do so no matter what counter argument is offered. Hence the determination to quit school is actually a decision in search of a justification.

Once one is found that makes sense, it will be adopted. *A Priority* is a perfect methodology for this student.

Finally in the scientific method of fixing belief the resolution of doubt is subject to high standards and remains tentative even if adopted. While the scientific method is well known, the question of doubt management is overlooked. It is not difficult to teach critical thinking students the scientific method and the combination of inductive and deductive reasoning used in it.

Students have difficulty applying scientific methods to issues where they have particularly strong views. This is because they have to manage doubt—that is, allow doubt to continue, without prematurely ending it. Students can learn to tolerate the ‘irritation’ longer or continue the inquiry longer. This will tend to produce higher quality science, higher quality arguments, higher quality dialogues and debates.

What is common to the good critical thinker versus the bad? It is not that the good critical thinker is more intelligent. It is that the good critical thinker is able to manage their doubt better. They are less afraid of doubt.

Therefore the key to teaching critical thinking effectively is to address doubt management.

The Person Who Thinks Critically

Here is where Peirce gives us the guidance for a successful critical thinking pedagogy. If we wish to bring about change in student’s habits of belief we need to address the underlying dynamic of belief and doubt. A pedagogy that addresses habits of belief in this context will capture the motivation for both internal and external beliefs. If internal and external beliefs are understood, they may be changed. If the dynamic of belief and doubt can be altered in favor of more disciplined beliefs, then critical thinking will be integrated with the individual student. When rules become habits of belief they will be authentic. Critical thinking is not merely a skill set, but being a critical thinker. The outcome of a critical thinking class is a person who thinks critically.

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