

A STUDY OF THE TEACHING OF CRITICAL THINKING
IN MIDDLE SCHOOL CLASSROOMS

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Jordan Scott Hitch
Northwest University
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Abstract

A Study of the Teaching of Critical Thinking

in Middle School Classrooms

Jordan Hitch

Critical thinking is a skill few utilize in today's society. This study seeks to determine how middle school teachers define critical thinking and how they believe they teach it in the classroom. A qualitative case study was performed by interviewing five teachers in a high-poverty, high-diversity middle school in Washington State. The interviews were recorded audibly, transcribed to text, and coded according to the grounded theory process. Analysis of the interviews failed to determine a comprehensive definition of critical thinking, but provided a good working definition: *Using the top levels of Bloom's Taxonomy to analyze a given context, thinking slowly and deeply, considering every angle, supporting ideas with evidence, in order to arrive at a conclusion.* It also identified common attributes of critical thinkers including open-mindedness, the habit of questioning the validity of information, the tendency to make connections, and the practice of thinking ahead. Further, some patterns emerged among teaching methods. Key among them was asking various types of questions, and a common goal in each method was determined: to make students arrive at their own conclusions. Finally, difficulties of teaching critical thinking were identified, in particular, students' desire to keep things simple and easy, and to go with the "quick answer," their first instinct. The study further concluded that teaching critical thinking is a community responsibility in which everyone takes part.

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Introduction

What do secondary level teachers think about critical thinking (CT)? How do they define it? How do they teach it? Or, more accurately, how do they *think* they teach it?

Anybody with more than one hundred friends on Facebook can tell that CT is not an active trait in a large portion of today's youth and young adults. Ridiculous, false statistics are swallowed whole and reposted on a whim merely because it happens to support that person's opinion. To quote Terry Goodkind (1994), a novelist, "people are stupid ... they will believe a lie because they want to believe it's true, or because they are afraid it might be true" (p. 397). Critical thinking stands opposed to this, and allows people not to be so easily fooled.

Clifford (1984) states that "participation in a changing and increasingly complex society requires citizens to process large amounts of information, sometimes to change careers and jobs, to relate with high sensitivity to others, and to operate effectively in ambiguous and unstructured situations. Such work demands thinking and thoughtful people" (p. 1). In a pluralistic society, we accept more than one idea. That does not mean we believe every (or more than one) idea, but we accept that *just because I'm 'right,' it doesn't necessarily make you ignorant*. In order to accept plurality, one must know how to arrive at his own conclusions by thinking critically.

Like any skill, CT must be taught and practiced. Some people, as with any skill, are more predisposed to learn and use CT than others are, and of those, some will learn it on their own, but the fact remains that it can and should be taught. But where? Over the past thirty years, there has been an ever-increasing push to teach it in schools.

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This educational push begs the question: do teachers know how to teach students to think critically?

Literature Review

A literature boom occurred in the 1980s. This is when the push and focus to teach CT in the schools began in full force (Vieira, Tenreiro-Vieira, Martins, 2011, p. 1). Most of the literature is philosophical research with very little empirical data (Shim, Walczak, 2012, p. 17).

Grant's (1988) book, Teaching Critical Thinking, is perhaps the most useful piece of literature on the topic as far as studying what teachers actually do in secondary classrooms in order to teach CT. She performed a qualitative study, immersing herself in seven different classrooms in a single school. Grant then wrote her observations of the four most interesting and most exemplary and effective teachers, and those teachers' methods for teaching students to think critically. Grant also quotes dozens of the philosophers tackling CT, making well-reasoned arguments that mutually support her qualitative findings.

Norris (1989) and Ennis (1985) are quoted everywhere in the literature. While Vieira, et al. (2011) credits Plato and Aristotle as the founders of the CT movement, and Socrates as the man who charged educators with the obligation to teach people to think critically (p. 43), Norris and Ennis appear to be the forefathers of this most recent push. Norris's article, *Can we test validly for critical thinking?*, is a very well thought out critique of the current, as of 1989, tests used for measuring critical thinking for research purposes. He suggests methods to test the tests, so to speak, particularly multiple choice tests. The biggest issue with multiple choice tests is the grader cannot determine the test-

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taker's reasoning for arriving at a particular answer. It is possible that a test-taker might arrive at a different answer than the test-maker and be thinking equally as critically. It is also possible with some questions that a test-taker using poor CT may arrive at the "correct" answer. In either case, the test question ought to be removed or remade if the test is to truly measure a person's critical thinking skills.

Ennis (1985) has the best, most concise, and most comprehensive definition of CT: "Critical Thinking is a form of rational, reflective thinking, focused on deciding on what to believe or do" (p. 46). Vieira, et al. follow this up arguing that all CT definitions "perceive CT as reflective and centered on assessment and problem solving" (p. 48).

It would be remiss, at this point, not to explain the largest issue around the study of CT: no one has a perfect definition. No one can agree on what the definition is or should be. There are debates around the "generalizability of critical thinking" and the "disposition to think critically" (Norris, 1989, pp. 21-22); there are debates on what CT entails, whether it includes *creative thinking* or *problem solving* or is separate from them, and then whether *creative thinking* or *problem solving* are precursors to CT or vice versa or neither (Grant, 1988); there are debates on a dozen other aspects of CT. Shim and Walczak (2012) illustrate this almost comically writing, "Teaching critical thinking skills to college students is complicated partly due to the disagreement over the definition and components of critical thinking (*e.g., see Ennis' [1962] 12 specific 'aspects'; Facione's [1990] 5 'dispositions'; Paul, Binker, Jensen, and Kreklau's [1990] 35 'dimensions'; and Clark and Biddle's [1993] 4 'processes'*)" (p. 17, italics added). Many authors agree that all definitions of CT have a set of commonalities, but they do not all agree on what

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that set is. What every author does agree with, however, is that the literature “leaves one groping for a clear definition of critical thinking” (Rudd, 2007).

Despite this debate over the definition, governments and politicians continue to push for the teaching of CT in education. (Shim, Walczak, 2012, p. 16). Perhaps this is not a bad thing. Despite not having it clearly defined, most people do have a general idea, a working definition for what is meant, and can point out key elements with which many other people would agree. The key elements *are* important for living in the modern world, and if they can be taught in the classroom alongside other skills deemed required for living in a modern society, they should. Grant says, “The secondary school is currently the only social institution specifically designed to develop these cognitive skills in adolescents. . . . No other social organization—not the peer group, the family, religion, or the work site—requires analytical thought in any sort of systematic manner. Thus if reasoning is not expected as a part of secondary classroom activities, it may never be developed.” (1988, p. 3) Grant is wrong on this point, however. The secondary school may be the only institution designed to develop thinking skills, but it should not be; just because some *instances* of the four social organizations she listed are not so designed, does not mean that no instances exist that are. All four—the peer group, family, religion, and the work site—can and should require and encourage the honing of higher thinking abilities. If CT is not required for these four organizations, which essentially encompass all of post-high school life, then why bother teaching them at school whose primary purpose is to prepare students for the real world? Vieira, et al. argue further that “the use of CT abilities also allows individuals to take a stand on scientific issues” (2011, p. 46) by teaching them first to question, and then to analyze for issues in a given scientific

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statement. This may seem like a leap from Grant's statement, but issues of science come up frequently within the peer group (eg, Facebook) and religion, and in certain families and work sites.

Others would argue that education *itself* requires the use, and thus development, of CT. Secondary education in a plural society asks teachers to challenge students to think about a topic from more than one perspective. This requires "that each individual be able to think critically about their beliefs, providing rational reasons which sustain and justify them. Additionally, they should be able to protect themselves from manipulations, safeguarding themselves from deceivers and exploiters" (Vieira, et al., 2011, p. 44). This is the ideal, but unfortunately is not *required* for education, at least as the high school diploma is defined today.

Contrary to this position, others suggest that CT cannot be taught in the first place. In theory, one should be able to teach it as it is a skill, and skills often merely require practice to be developed. That's philosophy. Daniel Willingham, in his article *Critical Thinking: Why is it so Hard to Teach?* (2007), writes, "After more than 20 years of lamentation, exhortation, and little improvement, maybe it's time to ask a fundamental question: Can critical thinking actually be taught? Decades of cognitive research point to a disappointing answer: not really." He goes on to suggest that while CT is a skill, it's not the same kind of skill as "riding a bike." At face value, this seems discouraging, but the heart of his argument goes back to what Norris wrote nine years earlier regarding the debate around the generalizability of CT. Learning to think critically about one topic does not necessarily allow you to apply those same skills to another. Willingham states "If you remind a student to 'look at an issue from multiple perspectives' often enough, he

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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.”

It is obvious Willingham believes that CT is hard to teach, and many more authors, teachers, and philosophers agree. According to Grant (1988) teaching CT is a difficulty rather than a problem, the distinction given by Barzun (1981): “Problems are solved or disappear with revolving times. Difficulties remain” (p. xix).

Holley and Boyle (2012) performed a qualitative study focused on multimedia learning resources and fashion marketing students. The study itself has little relevance to this paper, but one key line is, “the Course leader identified a lack of critical thinking as a key skill that was underdeveloped in many of the students. However, in an already content focused curricula [sic], there was little space to add yet more content” (p. 2). This is in stark contrast to McPeck (1981) who correctly argued, “Proposing to teach critical thinking in the abstract, in isolation from specific fields or problem areas, is muddled nonsense; thinking of any kind is always ‘thinking about X’ ” (p. 13). This statement aligns with Willingham's, as thinking about X requires knowing something about X.

Vieira, et al. (2011) wrote yet more philosophical research on the topic of CT, this time specifically on how it pertains to science education and scientific literacy. They point out that the majority of the literature and philosophy around CT has been centered on “courses of logic, principles of rhetoric and argumentation” (p. 47). They argue both that CT is a precursor to scientific literacy, and that the two overlap. They also give some tips for designing science curriculum that will (or could) stimulate CT within the

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context of the subject. Vieira, et al. quote Piette's (1996) theory on how CT relates to scientific literacy, which is, itself, a decent definition of CT:

- question the validity of arguments;
- reject conclusions which are not supported by valid reasons;
- detect tendencies, thinking and logic errors;
- assess the credibility of sources of information;
- identify the explicit and/or implicit assumptions in a statement or argument.

Their work was good, that is it was well thought-out and well researched philosophically, but as with most of these works, had little to no qualitative or quantitative data to back it up.

Shin and Walczak (2012) actually did what philosophers so far have failed to do: used quantitative research to produce real data about teaching methods' effectiveness in a classroom. They chose to study the freshmen college level, and focused on two aspects: how well students think they critically think, and how well they perform on the Collegiate Assessment of Academic Proficiency (CAAP), a widely used CT aptitude measure. Their analytical sample of 1,181 students from 17 four-year colleges and universities was not performed randomly (it was a sample culled from a much larger convenience sample – something the researches point out), but was performed as well as reasonably possible. Extraneous variables were well controlled. The control group was the group of students whose improvement rated most poorly. The groups that showed medium or large improvements were then compared to the group that showed the least. They correctly acknowledged the limits of their experiment, and many of the results were

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interesting, a few contradicting those of previous studies. Some of the most interesting results were:

- the best method for increasing CT skills in students was “asking challenging questions” – this was true for both the self-reported analysis and the objective CAAP test
- group projects actually showed a statistically significant decrease in objective ability to think critically – the researches attributed this to the grade-level, and the notion that freshmen need a more teacher-focused dynamic; they presented this explanation prematurely, and it warrants further research
- regional universities showed a statistically significant decrease in objective ability to think critically as compared to research and liberal arts universities which both showed increases (some statistically insignificant, some significant)

This was a thorough investigation, and while it is not worthy to stand alone (that is, further research is necessary in all aspects of this experiment), it was well executed and analyzed, there were a lot of data, and it is worthy of being read and thoughtfully considered.

Whether philosophical, qualitative, or quantitative in nature, many articles suggested methods for teaching CT. Shim & Walczak, as just expressed, suggest asking challenging questions, but their literature review also suggested that writing that requires large amounts of analysis is also useful (2012, p 17). Grant suggests having students compare and contrast forces them to use CT skills in order to detect differences (1988, p.

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19). She further suggests that amorphous problems are better than step-by-step, algorithmic ones. She says, “‘Instruction in problem solving usually emphasizes well-structured problems—the kind of problem which is clearly presented with all the information needed and with an appropriate algorithm available that guarantees a correct answer’ (Frederiksen, 1984, p. 363). But important social, political, economic, and scientific problems seldom are so neatly structured. *Teaching students to solve ill-structured problems would provide greater transfer of learning*” (p. 37, italics added).

It should be noted that there is a deeper concept here, a reason for learning to think critically that is more than just survival, an edge over people who do not, and the betterment of society: CT engenders a love of learning itself. One of Grant’s (1988) case study teachers presents a goal “to install a joy of learning even at the risk of spending hours of hard work at it” (p. 15), and Vieira, et al. (2011) sum up Tsui (1999) writing “Encouraging CT in students allows them to become lifelong, independent learners – one of the long-term goals of education” (p. 45). This is the heart, the drive of this research question.

In the context of this proposal, the most important notions to draw from the literature are:

- that “understanding how to teach critical thinking requires an understanding of the cognitive work of individual teachers” (Grant, 1988, p. 2),
- that “instructional techniques that not only provoke students to think differently (e.g., asking challenging questions), but also provide developmental supports (e.g., giving well-organized presentations,

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interpreting abstract concepts) are needed to foster students' critical thinking abilities; this balance is consistent with Sanford's (1966) theory that both support and challenge are necessary for growth" (Shim, Walczak, 2012, pp. 23-24),

- "that to promote student's critical thinking implies the need to create and sustain a learning environment that encourages students to express their ideas, explore, take risks, to share successes and failures and questioning each other. It also requires students to be given time to think, to experiment for themselves and to be encouraged, stimulated to discuss and to reflect on action through thought-provoking questions" (Vieira, et al., 2011, p. 52), and
- "that promoting student thinking skills requires careful planning if reasoning is to be practiced systematically and regularly" (Grant, 1988, p. 36).

Research Question

I set out to answer with my research two primary questions: How do teachers define CT? and How do teachers believe they teach CT to their students?

In the course of developing and researching the answers to these questions, I developed the following questions to help the teachers I interviewed more fully answer my two primary questions.

- How important do you think CT is?
- Can CT be taught in a classroom?

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- Do you think it should be taught in a classroom? or On whom do you think the primary responsibility falls to teach CT?
- Have you done any research on how to teach CT? Has it helped?
- What do you find difficult to teach—or what do your students find difficult to learn—when it comes to CT?
- How much does creative thinking affect CT?

Methodology

Methodology and Rationale

All of the philosophy, thinking, and literature reviewed above are important and (some of it) crucial to teaching CT in the classroom. However, all the writing in the world makes no difference if it does not make it to the teachers' minds and methods. So, I set out to study what secondary level teachers *actually* believe about CT and how they teach it—if they teach it.

There is no quantitative study that can answer these questions. Creating a Likert scale form (or a similar survey) for teachers to fill out, suggesting different aspects of CT and how important they are would likely a) be incomplete, b) suggest that all (or most) of the definitions and aspects are important, and c) not answer if and how teachers actually teach CT, nor how effective a job they believe they are doing.

Therefore, qualitative research makes the most sense. I performed a case study, interviewing five middle school teachers. These people were chosen by asking the principal and vice principal for the names of teachers who would have interesting ideas, philosophies, and methods of teaching CT. I also asked for names of teachers that either would not think CT could be taught in a classroom, or felt it should not be (because it

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should be taught elsewhere), as that would be an interesting case. However, no names came to mind.

Sample

Four of the five teachers interviewed were in both the principal's and vice principal's lists, though they were not the only teachers listed twice. At the time of interviewing, I believed all five were on both lists, but after double checking my notes, one was only on one list. That even four of the teachers interviewed were on both lists was coincidence. I sent out an email to every teacher on each list, and these five were the ones who agreed to do the interviews.

Each interview lasted between 33 and 60 minutes long. They covered each of my primary and secondary research questions, as well as any other aspect that arose during the course of conversation. The question about creative thinking was not a question in my research proposal, but was an important aspect of the first interview, and I added it to my list then.

The teachers interviewed teach at a high poverty, racially diverse middle school in Washington State. About a quarter of the student population is Asian, 10% is African American, 20% is Hispanic, and 40% is Caucasian. The remaining 5% is composed of other minority groups or students reporting more than one race. Forty-five percent of the student population is applicable for free or reduced-price lunch, and 7.5% are transitioning bilingual students.

Instrumentation

The interviews were recorded audibly. Afterward, they were transcribed by me into text, removing or replacing names and other identifying words.

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Analysis

Applying the Grounded Theory research method—commonly accepted for qualitative research—I first conducted open coding. I used CATMA (<http://digitalhumanities.com/catma>) to code the texts of the interviews using a total of sixty-four different “tags.” I searched specifically for: different components of the definition of CT, the importance of CT, the methods teachers use to teach CT, the difficulties in teaching CT, who is responsible for teaching CT, and other important aspects and facets of CT—that is, any patterns that emerged in the interviews. For example, “being respectful of other people’s views and opinions,” is not part of CT’s definition, nor is it a method of teaching CT, etc., but it is something that every teacher mentioned in her interview. I especially noted any real-life example of a teacher teaching CT to her students. Any time I found a passage that seemed applicable to answering my research questions, but did not match any of my current tags, I created a new tag.

Next, I performed axial coding by reviewing these tagged fragments, searching for patterns within the passages. These patterns became the primary themes of my findings, resulting in my theories about the answers to my primary questions.

Finally, during the writing of this paper, I used selective coding to find quotes to support my theories.

Validity

This study was a case study, and as such, is not externally valid or generalizable. The sampling procedure was not random, nor need it be.

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I realized upon completion of my interviews that all participants were female and none of them teach math or electives; only reading, language arts, social studies, and science teachers were interviewed.

These were all teachers from a single, public school. No teachers of other demographics or populations and no private school teachers were interviewed.

The interviews are the only data examined in this study. No triangulation was performed to improve validity. Therefore, this study only covers what these five teachers *say* they do in the classroom, and not necessarily what actually occurs. Critical thinking is a vast topic; it is one society considers of crucial importance, and one the government considers to be of high priority for the public education system. Very few teachers would want to appear weak on this topic, even anonymously, and so they may overstate their methods or the frequency with which they're used. In fact, one interviewee remarked, "I think people are afraid to say 'What is critical thinking?' or 'What is a critical thinker?' Especially educators, that they're afraid of, 'Oh I must not do my job right, because I don't ever think about that.'"

I am a fairly intelligent person who considers himself to be a critical thinker; I've been told such by multiple people, including a few of the interviewees. I have very strong opinions regarding the importance of critical thinking (that it is important), and can point to the public school teachers that most nurtured and grew my critical thinking skills. Therefore, going into this study, I believed it can be taught—or at least practiced and improved if in reality its core cannot be taught—in public schools. I get frustrated by people with low critical thinking skills, and border on harboring contempt for people when they are consistently apathetic about critically analyzing an important issue or

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situation. These biases are all possible threats to the validity of this paper. They are also, however, the reason this study was conducted.

Data

Below are the five teachers I interviewed, how long they have been teaching at the time of the interview (including the school year during which the interview took place), and the classes they teach. I forgot to ask Ms. Williams how long she had been teaching, but she did say she taught at a zoo for a couple years before becoming a middle school science teacher.

Table 1		
<i>Information About the Teachers Interviewed</i>		
<u>Teacher</u>	<u>Years Teaching</u>	<u>Subject(s)</u>
Ms. Lei	10	6 th /7 th grade reading Classes specifically for high-level and low-level students
Ms. Harris	12	7 th grade social studies 7 th grade honors social studies/language arts
Ms. Clark	3	7 th grade science
Ms. Moore	6	8 th grade language arts
Ms. Williams		8 th grade science Pursuing 7 th grade math endorsement

Table 1

The following two tables list the overarching themes I found during my coding, the number of samples that fell under those themes, and for some sections, a choice quote. Each question is answered in two parts, so each table has two sections. The number of samples listed are somewhat arbitrary as a sample may cover just few words

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or several paragraphs depending on the text of the interview itself and how focused the interviewee was at the time of responding. When several sentences in a row all related to the same topic, I marked it as a single sample. Conversely, when an interviewee jumped around and touched on several different topics at once, returning to a theme repeatedly, that section was tagged as several samples.

The Analysis section will include more quotes from the interviews not listed here.

Table 2	
<i>Themes Found for the Two-Part Answer to “How Do Teachers Define CT?”</i>	
<i>Definition of Critical Thinking</i>	
These are the themes present in how teachers defined critical thinking.	
Bloom’s Taxonomy	9 samples
Analysis	31 samples
Slow thinking and deep thinking	13 samples
Ms. Clark	[CT is] a time thing, so, when you stop and really think about something.
Application	18 samples
Doing research and supporting with evidence	26 samples
Ms. Williams	... thoroughly answer the questions using evidence that they've used in class, or that they've learned in class, evidence that they've gathered outside of class.
Considering every side	6 samples
Arriving at a conclusion	30 samples

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Important Aspects of Critical Thinkers

There are aspects of critical thinkers that do not strictly fit into the *definition* of CT, but are important nonetheless.

Open-mindedness	9 samples
Question validity	10 samples
Making connections	15 samples
Thinking ahead	10 samples

Table 2

Table 3

Themes Found for the Two-Part Answer to “How Do Teachers Think They Teach CT?”

Methods for Teaching Critical Thinking

These are themes that commonly arose from how teachers described how they teach critical thinking to their students.

Asking questions	13 samples
Modeling	17 samples
Ms. Williams	I will model with the students walking through the steps, and I will actually tell them what's going through my mind and thinking through the problem.
Challenging students	5 samples
Groups	10 samples
Ms. Harris	You can have them work in groups, you can do different types of pair-shares. My goal is that every kid talks, every day about what we're learning about. Sometimes it's just with a partner, sometimes it's with a team, sometimes it's with the whole group.

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<i>Difficulties of Teaching Critical Thinking</i>	
Largely what shapes teaching methods are the difficulties they must address. The same goes for teaching CT.	
The quick answer	6 samples
Physiological development	7 samples
Parental support	5 samples
Confidence	2 samples
Teachers	5 samples
Ms. Williams	You can't really model and teach [CT] in its little fashions to the students if you're not [a critical thinker] yourself.

Table 3

Trayvon Martin Vignette

Before we dive into the analysis of this data, one vignette given by Ms. Lei is particularly noteworthy, and I will reference it frequently. The text is many pages long, so I will summarize it here. Everything in quotations is a quote from the interview.

In February 2012, Trayvon Martin, a 17-year-old African American, was shot and killed by 28-year-old George Zimmerman. Using only the information (true or false) from the interview, and not facts now known after the completion of the trial, George was the neighborhood watch captain who saw a person he did not recognize and felt looked suspicious. He stopped the person, Martin, and told him at gunpoint to empty his pockets. At some point, Zimmerman felt like his life was in danger and shot Martin, who turned out to be unarmed.

All of Ms. Lei's students, many of whom were ethnic minorities, were in an uproar. "It's a race thing!" Ms. Lei simply asked, "Is it?" She told them that she is the

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captain of her neighborhood watch, and it is well within her rights to stop a suspicious person wandering her neighborhood. It is not alright, however, to retain that person at gunpoint and tell him to empty his pockets.

Ms. Lei went home and gathered three articles: a news article, an article from Martins's parents' point of view, and an article from Zimmerman's point of view. She didn't tell her class that she had brought in three, but at first only handed out the article from the news, "because you know how the news is *always* right, right?"

She had her class, after reading the first article, jot down their thoughts and discuss. The class was still convinced this was a race issue. Again she asked, "Is it?" At this point, "one brave kid" said that maybe it wasn't. "Maybe it was just an accident that happened." The discussion went from there and a few more kids began to question their initial thoughts.

The next day she had them read the article from Martins's family's point of view. After this, some of the kids began to think that maybe it wasn't a race issue. "Maybe it was an age issue," or maybe something else. Ms. Lei pointed out to me in the interview that at that point in time—early in the investigation—much of the news was anonymous and it was hard to verify credibility.

Finally, one of the kids asked, "Well what about [Zimmerman]?" She asked whether it made a difference what race Zimmerman was. The kids responded that he must have been white, because it was *clearly* a race issue. At this point she leaked an article to them, allowing them to discover that Zimmerman was, in fact, half Hispanic. (A large number of her students were Hispanic.) It completely threw a wrench into her students' views and theories.

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Now the students *wanted* to do more study, find articles on their own, and bring them into class. They wanted to do more analysis of the situation.

At the end her kids said, "You made us change our minds."

She responded that she hadn't. She just forced them to think critically, to challenge their own assumptions and back their thoughts up with research. When they looked at more than one point of view, they made up their own minds. All she really did was ask, *are you sure?* and get them started with research.

Analysis

As the previous section's grouping made apparent, after analyzing my data, I have developed four theories about the answers to my two primary research questions. The first question, "How do teachers define CT?" must be split into two parts: the definition of CT, and important aspects of critical thinkers. The second question, "How do teachers teach CT?" I've split into: methods for teaching CT, and difficulties of teaching CT.

Definition of Critical Thinking

It is perhaps unsurprising, given CT's long history of refusing to allow philosophers to pin (or pen) down its definition, that interviewing five teachers did not yield a clear definition either. There were commonalities and themes across each of the five—in fact there were too many of them. Studying or teaching "critical thinking" is more akin to studying or teaching "science" than it is to studying or teaching the "properties of hydrogen." Critical thinking is not one aspect of thinking, but rather encompasses most aspects of thinking.

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Bloom's Taxonomy.

Bloom's Taxonomy is a widely regarded hierarchy of thinking. It categorizes and ranks the different levels of thinking from low to high. Those levels are knowledge, comprehension, application, analysis, synthesis, and evaluation. Four of the five teachers mentioned Bloom's Taxonomy by name. Ms. Lei said she knew that the "true" or "academic" definition of CT was using each of the six levels. On the other hand, while Ms. Harris references Bloom's, she feels that having students use the top three levels—analysis, synthesis, and evaluation—is having them think critically. The other teachers mention getting students to think at Bloom's higher levels as goals for their students.

Analysis.

One of the most common words used by the teachers in their interviews was “analyze,” Bloom's fourth level of thinking. Ms. Moore defined CT as, “looking deeply at content, whatever the content, and *analyzing* it for purpose, meaning, and relevance in their life.” (italics for emphasis) Ms. Williams stated that her research on how to teach CT in the science arena all pointed to having students analyze their data. Ms. Lei, described her struggles teaching CT to a student who was an avid reader and can recall, summarize, and repeat verbatim every event in a story, but couldn't analyze any of it. Clearly analysis is a key component of CT.

Slow thinking and deep thinking.

Similar to analysis, several teachers emphasized the need for slowing down to think deeply about a concept, situation, or problem, and resisting the urge to accept the first thing that pops into one's head. Ms. Clark defined CT, “as a time thing, so, when you stop and really think about something.” She continued describing the importance of

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analyzing all parts of a problem and solution, and not leaving any "gray areas" unconsidered. Similarly, in the previous section, we saw that Ms. Moore used the phrase "looking deeply" in her definition of CT.

Ms. Lei's vignette of how her students reacted to the Trayvon Martin case is a perfect example. The students jumped to their first-thought conclusions. "This is a race thing!" Critical thinking involved slowing down and thinking deeply about the incident.

Application.

Every example of CT a teacher discussed included some sort of application. Students had to be thinking *about* something. This supports what McPeck said regarding "thinking about X." This pattern could be due to all of these teachers being teachers of X. However, Ms. Lei, a reading teacher, finds that helping students self-evaluate helps them to understand why they are in a lower-level reading class. In this case, the application is oneself, rather than reading or what is being read.

Ms. Clark stated that CT is not taught in "some kind of weird lecture ... 'this is what CT is,'" but that you "just have to make kids do it." This is because CT requires an application.

The teachers were very keen on CT taking place in any and every context. Students' CT skills vary from context to context. Ms. Lei said that with her self-evaluation, kids found it powerful to realize that they reached different levels in different subjects. The hard part for her, then, is getting students to figure out how to apply the high CT skills they have in other classes, like math and science, to their own reading.

It is clear that an application is required for critical thinking.

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Doing research and supporting with evidence.

Every teacher said that CT includes supporting ideas with evidence. Where does one get evidence? One does research. Ms. Williams said a critically thinking student must be able to “thoroughly answer the questions using evidence that they've used in class, or that they've learned in class, evidence that they've gathered outside of class.”

Ms. Moore said one must “have evidence to support that it's not just your idea or your thought or your feeling, but you have evidence to support your idea.” Later she said, when disagreements arise you should maintain your theory unless someone’s *evidence* convinces you otherwise.

Ms. Lei’s Trayvon Martin story is another excellent illustration of evidence gathering. Thinking critically about the case required a lot of research.

Considering every side.

Critically thinking means considering every side to a situation, issue, or problem. As a parent, Ms. Moore would ask her kids probing questions to discover whether they had considered (or been presented with) every side of an issue brought up in social studies. She feels that this taught her kids to look consider an issue from every angle and that this now allows them to not be “bamboozled, or impressed with bells and whistles and fast talkers. ... They look at things more critically.”

During voting season, Ms. Lei’s students ask her who she’s voting for. She replies that she votes for the “best person” regardless of party. As the youngest of nine kids, polling her family allows her to see many different angles. She said if you only consider what *you* want, “then it's so narrow-minded. And then you miss all the other parts too.”

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Ms. Lei also illustrated seeing every side in how she handled the Trayvon Martin case. She brought in three different angles forcing her students to consider every angle of the case before coming to their own conclusions.

It is evident that CT involves approaching a context from every angle, looking at every side of an issue.

Arriving at a conclusion.

The purpose of CT is to arrive at a conclusion. At one point in my interview with Ms. Williams, I tried sum up her definition of CT as “asking, ‘What if?’” She responded that merely asking “What if?” is not enough. You have to follow it through to an answer.

I asked Ms. Moore if there was a point at which one can critically think much. Her response was profound.

The world is constantly changing and things are constantly developing and growing, [so] we can't "what if" everything that we look at. If you're constantly doing that then there becomes no resolution, and no solution of moving forward. So I think that there needs to be a process of critically thinking to one end. That may be a temporary end, and once we accomplish something, then critically thinking about *that*, and adjusting and growing.

All together now.

Combining each of these traits, a reasonable definition of CT is “Using the top levels of Bloom’s Taxonomy to analyze a given context, thinking slowly and deeply, considering every angle, supporting ideas with evidence, in order to arrive at a conclusion.” However, like all definitions created to date, this definition is still incomplete. For example, it is missing the elements of reflection, self-analysis, and metacognition—key ingredients according to previous philosophical research. This is just the definition that fell out of the patterns in the interviews.

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Important Aspects of Critical Thinkers

There are aspects of critical thinkers and the environment and mind set of critical thinkers that do not fit into the *definition* of CT, itself. Nevertheless, they are important.

Open-mindedness.

Aristotle said, “It is the mark of an educated mind to be able to entertain a thought without accepting it.” Critical thinkers have open minds. They are open to new evidence and are willing to abandon previously held beliefs if the new evidence holds up to scrutiny. In order for this to happen, a critical thinker must be willing to remain civil while disagreeing with a peer, and must be willing to listen to things that don’t immediately match their currently held beliefs. One must be open-minded in order to objectively look at every side of an argument—part of our definition.

Speaking to her students at the end of her Trayvon Martin example, Ms. Lei said (*italics mine*),

I need you guys to see that you can't just take one article, one reading, one thing, or one person's voice, and accept that. You should be *willing* to think deeper, and challenge that. Even if it is the same belief that you think.

The willingness to see the other sides is what makes an open-minded thinker. It does not mean that you accept every theory you happen upon, but that you are willing to consider every side in the first place.

Question validity.

The other side of the open-minded coin, critical thinkers question the validity of things they see, hear, and read. It may turn out that a piece of information is correct, but a critical thinker stops and does some research before accepting the information as fact.

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Likewise, the critical thinker checks theories against themselves for logical contradictions. There is always some level of healthy doubt in a critical thinker's mind.

As just read in the above Trayvon Martin quote, the students should not just take one source and accept it. They had to think deeper and challenge it.

Ms. Clark also gives a comical example discussing a tool another teacher in the building uses: the tree octopus website. Obviously, as octopuses live in the ocean where there are no trees, such a creature does not exist. However, someone made a website that looks legitimate with videos, high-quality photoshopped images, fake quotations, and testimonials. Every year, her students come in swearing that this animal is the real deal. "What? Where do octopuses live?" Despite her questions, they still believe until the end of the week when the teacher reveals to his students that the site is a hoax. "Yeah, you're right. It's not true," she mimicked, with ironic dejection.

Making connections.

A critical thinker draws connections between the context being thought about and their own lives, the lives of others, and society at large.

Ms. Moore described one application of CT as being students asking, "How does [language arts] apply to us?" I followed up asking about a student who decides that the content doesn't apply to his or her own life, and so why should they continue learning it? She said that critically thinking about a context is more than just considering how it applies to the individual but also to the world. Further, especially in school, when students don't have a realistic vision of the real world, if a student does not see how something like language arts could apply to them in the future, then they need to "delve deeper." For example, if they argue that they will never write essays, then they have not

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considered the skills required in order to write decent essays that they will use later. It is not the essays, but the skills that go into them that have applications. In order to critically think by asking “How does [language arts] apply to us?” they need to follow through with their thinking by thinking deeper, considering every angle, and *then* making connections.

Ms. Lei had an especially touching example of how she gets her students to apply their reading to their lives. A girl of hers was reading a book titled *Soul*. She approached Ms. Lei saying that it was a higher level book, comparing it to a more fun book which while reading, she “didn’t have a lot of thoughts.” *Soul* is about a girl from Nepal who is sold into slavery. After some more prodding, the girl said, “This book made me want to cry, it made me care, and then it made me think, ‘What could I do to help kids like this?’” This spun into a class-wide conversation. “Every single one of my eighth graders was reading and [critically] thinking.” All of this was because a student made connections from her reading to the real world. “I’m so proud of her.”

Thinking ahead.

Critical thinkers think beyond the here and now. Along with making connections, they think about the future and how a conclusion or decision will affect the long run. Ms. Clark said the impact *not* critically thinking might be greater negative consequences because such a person would not have considered the repercussions of their choices.

Ms. Lei illustrates the importance of thinking ahead to her kids by applying it to their performance and persistence in school.

This is how I explain it to my kids. "You can turn 16. If you make the choice to drop out, and I wouldn't recommend it, but if you do, you get a job, you're right. You make good money right now, for your age. You save up, you buy a car, maybe in three or four years.

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You pay off the car in four or five years. Okay, you're doing ok. Maybe you manage. Say then, another student, goes to school for four years, finishes, graduates. Works there part time, goes to college. In four more years, they come back, and I don't want to say 'own you,' but I say it in that sense, that they become your boss. They tell you what to do. And they make twice as much, or three times as much as you. ... Now think about that."

Her students try to argue that she doesn't know what it's like to be poor, but she grew up in similar circumstances to many of her students. She understands the need to take care of one's family that her students try to use as a rebuttal. So she ran with that rebuttal and did some more thinking ahead, pointing out that financially successful people can better take care of their families.

Methods for Teaching Critical Thinking

While CT remains notoriously ambiguous, the methods these teachers use for teaching CT are a bit more concise. None of them teach CT exactly the same way—all of them have various tools in their “toolbox”—but after a lot of consideration, the goal of all of these teaching methods is the same: allow or force students to come to their own conclusions.

Rounding off Ms. Lei's Trayvon Martin example, when her students accused her of changing their minds, she said, “I didn't say anything. I just wondered.” All she did was have them to do the research. Did she have her own opinions on the matter? I am sure she did, but she did not cherry-pick or alter the evidence, aside from being sure to cover all three key views. The students believed she had changed their minds, but all she had really done was forced them to go through the steps in order to make their *own* informed decision. This was her goal from the beginning.

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Asking questions.

The only teaching strategy described by all five teachers was asking questions. In fact, Ms. Clark relies almost solely on this method. As a science teacher, she uses “big overarching questions” such as, “How did polar bears become white?” Her students immediately assume they know the answer and can sum it up in a single word, “evolution.” From there she starts picking apart their understanding by asking deeper and deeper questions. “You ask them more about those science words, and you find out they had no clue about it ... and then they start to get stumbled up with their theory and their ideas.” From these questions she can eke out on what the students have a solid foundation, and what they still need to be taught. These questions force her students to slow down and think critically about what they actually know and what connections they can make between concepts they understand in order to form more complete theories. “They don't realize that what they're doing is the slow practice of critical thinking and patient problem [solving].”

There are a few different kinds of questions that serve different purposes. Ms. Clark in the example above uses probing questions. The purpose of these is point out to students what they do not know or have not yet considered. They are for poking holes in a student's response. The goal is to get kids to, “stop and really think about something.” The purpose is not to attack, but to get kids to realize they have not figured it out yet. In another example, she states (*italics mine*),

I'll be like six, seven questions in and that's when they start to go, “I don't know. I really— wait, I need to think about this more.” *So then I can back off and let them think about it.*

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After the students have realized they're missing some pieces, she does not laugh victoriously nor give them the answer. They have to go figure it out and arrive at their own conclusions.

A second type of question a teacher could ask is an open-ended question. Only Ms. Harris explicitly mentioned open-ended questions, but a few others brushed up against the notion. Ms. Harris discussed a concept called "group-worthy tasks." This is where the students are presented with a real life, optionally simplified, problem. The students then have a real world connection, and it encourages (and forces) them to think "in many different ways to come up with a solution."

Students find these tasks difficult. The nature of open-ended questions requires that students are not told exactly what the answer should look like, which can be frustrating. Ms. Harris continues, "CT assignments *are* frustrating because it isn't simple, and there are things that they have to grapple with." Letting the students know that the question being asked is open-ended and should, therefore, be challenging "eases them up a little bit to know that this is what they should be experiencing with this particular task."

Another type of *asking questions* I will label thought-provoking questions, and this strategy is used for guided practice. If the goal of probing questions is to point out a flaw in a student's thinking or a hole in a student's knowledge, the goal of thought-provoking questions is to encourage or guide students to think about the parts they are missing. They give students an idea of *how* to think about something. It is this type of *asking questions* that overlaps with *modeling*.

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Modeling.

Ms. Clark relies entirely on asking questions in order to “make the kids do it”.

The other four teachers discussed how they model for their students what CT looks like.

Ms. Lei said, “I look at teaching CT as a scaffold and meeting optimal learning meaning that I’m going to have to model for my students first. Particularly working with remedial students I always primarily start off with modeling, showing them how I would do [it].”

Ms. Williams uses thought-provoking questions to model for her students what CT looks like. She walks her students through each step, each thought that she would have solving the problem. “Well what causes that? Well, let's think back to what do I know about my parts that I can put together to answer that one little question? Okay, well then what causes that?”

Ms. Harris described a similar process. She pointed out that students need CT to be modeled because teachers assume too much about what students know and what they know how to do. Students don’t know what it means to think critically (neither do researchers) so they have to see it done, thought-by-thought, and action-by-action: asking questions, making connections, doing research to fill gaps. “You give them a structure to start to be good at it themselves. And then you challenge them with it.”

Challenging students.

Challenging students is key to CT. This is because, as Ms. Harris put it, “CT assignments *are* frustrating because it isn't simple.” If the assignment is not a challenge, then the students do not need to practice CT. Ms. Harris pointed out that even students

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who, for whatever reason, are naturally more inclined to think critically need to be challenged.

I think that you definitely have to challenge brains to the next level. For those synapses to make connections and for there to be growth and connections, I mean, somebody can be born with a high IQ, but you still need to foster it, you still need to challenge it in order for it to continue to grow.

Ms. Lei alluded to the fact that, eventually, good critical thinkers begin to challenge themselves. They become self-sufficient and can arrive at their own conclusions through good critical thinking.

Groups.

Often students learn best when being taught by, or in groups of, their peers. They feel they are on equal footing and so are more confident that what they have to say has worth. This gets them more involved in their own learning, and allows them to take ownership of that learning.

One of the more popular methods for teaching CT in groups is the Socratic Seminar. This process involves having students pre-read several documents. During class, the students are given some questions to discuss and must back up their ideas with evidence from the reading. They also have to ask each other questions, challenging each other, and finally they must decide whether they agree or disagree with their classmates, and say why. This involves a great deal of practice of thinking critically.

Note each of these steps is a part of the definition of CT gleaned from these interviews. Pre-reading of several documents is *research* on a certain context, a certain *application*, and if it is done right, it is also performing *analysis* on those documents. Referencing the documents to support their thinking is *supporting with evidence*. Class

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discussion encourages *considering every side*, as does asking each other additional questions. Finally, agreeing or disagreeing with their classmates is *arriving at a conclusion*.

During Socratic Seminars, students must remain open-minded. Asking each other questions could (and should) include all three kinds of questions teachers use: open-ended questions to get the conversation started, probing questions to point out holes in each other's theories, and thought-provoking questions to get each other to think more deeply about the topic at hand. Ultimately, Socratic Seminars forces students to arrive at their own conclusions.

Socratic Seminars is a great method for assessing the CT abilities of a student, which is usually hard to do, especially for students who refuse to do work. Ms. Moore found that those students love Socratic Seminars because it allows them to show off their thinking abilities without having to write anything.

Obviously, Socratic Seminars is just one method of group work, but it came up with a couple teachers and highlights CT skills very well.

Difficulties of Teaching Critical Thinking

If teaching were easy, we wouldn't have to think critically about it. We wouldn't have to develop methods to teach. So, it is in fact the difficulties of teaching that mold the methods to teach best.

The quick answer.

So often, students want to rely on their first-thought answers. As CT involves slowing down and thinking deeply about the topic at hand, this instinct serves as CT's antithesis.

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Ms. Clark suspects a reason for this behavior is that our media makes everything instantaneous, relieving students of the burden of thinking. Further, the internet allows easy access to virtually any information a student would want, and present this information “in just two or three sentences max.” This is often enough for the student, and they feel they now know the answer. So it is our quick-paced, instant gratification-based lives stand in opposition to CT.

Physiological development of middle schoolers.

Other teachers suggest the reason for this reluctance is developmental. Going through puberty is a lot to deal with. Between physical changes, social pressures, and other energy-draining circumstances of middle school life, investing the time and energy to critically analyze a subject that, from the student’s point of view, doesn’t immediately apply to life, is a challenge. Ms. Williams said that unless students are guided toward CT, they won’t do it. Later, she pointed out that this energy is sometimes even difficult for adults to muster. Sometimes we just want the answer given to us so we can deal with the rest of lives.

Parental support.

There are two aspects to parental support. The first is that teachers need their students’ respect in order to be effective teachers. That respect is learned in the home. Ms. Lei contrasted her experience teaching in Japan to that in United States, saying that because education in Japan is directly paid for by the parents, they are a lot more stringent. This results in a greater amount of respect by both the parent and the student for the teacher. The teacher becomes not just the teacher but also “the counselor, and the

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parent at school. ... That means I'm going to push you and not baby you." She was able to push students harder and further because she had that extra respect.

The second part of parental support is that teaching CT needs to happen first in the home. It needs to start well before middle school. Ms. Williams said that it should begin as soon as a kid is learning to move around. "It's really got to start from, I would say, parents, before they start school, and the moment they enter pre-school and on. And then we're just developing on those skills as we move on until they leave us." It is not just the parents' responsibility but also that of people in who come in contact with the child. Not all children have parents or good parents, and so it needs to be community members, the neighbors whose yard the kids play in. Everyone is responsible for teaching the younger generation to think critically.

Confidence.

Students often lack the confidence to think critically about a topic. Ms. Moore said that students are afraid that because they think something different from the teacher, saying so will result in some form of humiliation or discipline. If students were encouraged to think critically more often and earlier, they would be more willing to challenge a teacher or another student in class and start a conversation. But as it is, students do their best to act as drones and just do whatever the teacher tells them to do.

When asked where students learn not to think Ms. Moore stated,

Actually, school. I think that we put so many rules and rigidness of how you learn, and the way you learn, and make sure you sit in your desk appropriately, and you have these certain supplies and you do it a certain way. ... We do that from like kindergarten. So that they stop. "Okay, well, I wouldn't have done it that way so obviously I'm wrong. So I

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better just do what teachers tell me, and I'm not going to even think for myself anymore."

So I think that we're our own worst enemy when it comes to that.

Confidence plays a part in getting students motivated to think critically. They have been conditioned to believe that considering other sides of an issue is wrong or unnecessary. This greatly discourages creative thinking which many of the teachers said played some sort of role in CT, though that role varied.

Teachers.

Critical thinking, not unlike other skills, must be taught by people who are good critical thinkers themselves. Ms. Williams states rather succinctly, "You can't really model and teach it in its little fashions to the students if you're not [a critical thinker] yourself."

Many times, when asked whether the interviewees did research on how to teach CT, the research or professional development training they did resulted in improving the teacher's own CT more than anything else, which in turn, they feel, helps them be better teachers of CT.

Implications

The reason this study was conducted was a frustration with my peers' inability to critically think. That begged the question of who was supposed to teach them, which dovetailed into how it was being taught in schools today. I am not laying the blame on teachers—far from it. Ultimately, it is the individual's responsibility to expend the energy and think before acting. However, it is everybody's responsibility to teach and encourage everyone else to become better critical thinkers.

This study has two sets of implications: that for the individual, and that for the education system.

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The Individual

If you aspire to be a good critical thinker, then it is important to remain open-minded. Question the validity of information, but only to the point where it is helpful in moving forward. There *are* good sources of information out there, and trusting nothing gets you nowhere. Just give everything its due diligence. Resist the first-thought answer. Before you make a claim, do the research so that you can back it up with evidence, and make sure you have considered every angle. Strive for a conclusion, even a temporary one.

Be civil. Even with all the information Google has to offer, multiple viewpoints may still be valid until more research is done. And eventually, some cases may come down to opinion, in which case it is okay to disagree with someone.

Finally, think ahead. Don't act without first considering the consequences of that action.

The Education System

Studying how these five teachers grow their students into critical thinkers has made one thing abundantly apparent. Students must reach their own conclusions. The methods for achieving this goal are varied and depend on what the teacher finds most successful for the combination of the teacher and the class he or she is teaching. Asking questions seems to be key to any method. It is important that a student be taught how to reach those conclusions, and that they are slowed down, challenged to think deeper than they want to. The process is more important than the content. An avid learner can find the content on one's own. A vessel of content with no meaningful connections to how it

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affects the student and the world around them, and with no drive to make those connections, will quickly forget the content.

The education system doesn't just involve teachers. It involves the government, and it involves the community. Teachers need support, not blame. They need respect, and more importantly, students need to see parents respecting teachers, so that that same respect is reflected in the classroom. Parents need to challenge their kids to learn, to ask why, and what if, and then to find the answers to those questions. Students need the confidence, the permission to think differently and to be wrong once in a while.

The American government is pushing CT hard right now. It would be helpful if they gave us a definition.

Finally, we do need good teachers. A bad critical thinker cannot model good critical thinking. This doesn't mean we fire the bad critical thinkers; it is a challenge to grow in their CT ability. Critical thinking is a skill.

What Next?

Future research might tackle the question of why middle schoolers (and adults) fight to stick to their first-thought conclusions, and how best to curb that tendency. It might identify some people with high CT abilities and learn how they were taught to become such. And for the tenacious, there's still that definition.

Conclusion

Critical thinking is crucial to the development of society as well as to the individual's wellbeing. Its definition eludes us to this day, but many people have working definitions that fit most cases. Methods for teaching critical thinking are varied, but the common goal is for the student to learn to reach their own conclusions. It is the

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responsibility of every person to be involved in nurturing and growing our youth into good critical thinkers.

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