Why Students
- and Often Teachers -
Don't Reason Well

The Ability to Reason:
A Defining Feature of Humans

Our capacity to reason is at the heart of all disciplined thinking. It explains how we alone of all the creatures of the earth have been able to develop full-fledged academic disciplines: biology, physics, botany, zoology, chemistry, geography, history, psychology, sociology, etc. We can go beyond immediate, instinctive reactions to reflective, reasoned responses precisely because we are able to develop small-scale and large-scale systems in which to intellectually operate and act. These systems enable us to mentally manipulate our possible responses to situations — to formulate them explicitly, to hold them at intellectual arm's length, to analyze and critique them, and to decide what their implications are for us. Let me explain.

We understand the various particulars of everyday life by constructing abstract models or systems that abridge and summarize their features. In simplest form, we call these models or systems ideas. For example, our abstract concept of a bird is a model or system for thinking about actual birds in order to make sense of their behavior — in contrast to the behavior, say, of cats, dogs, turtles, beetles, and people. As we construct these abstract systems or models, we are enabled to use the reasoning power of our minds to go beyond a bare unconceptualized noticing of things to the making of inward interpretations of them, and hence derivations from them. In short, our concepts provide our minds with systems in which to experience and think; our minds operate (reason) within them to invest the world we experience with meanings rich in implications and consequences. Much of this is done, of course, quite automatically and subconsciously.

I can reason to any number of conclusions as the result of my having one simple model for a thing. For example, if I recognize a creature to be a dog, I can quickly infer it will:

- bark rather than meow or chirp
- wag its tail when pleased
- growl when irritated
- be unable to fly
- have no feathers
- be unable to live under water
- be carnivorous
- need oxygen
- have teeth
- have paws rather than feet, etc.
This word (‘dog’) is part of a much larger logical map upon which our minds can move in virtue of our capacity to reason. As we act bodily in the world, we act intellectually in our minds. These intellectual moves guide our actions in the world. Without these maps and the capacity to locate particulars on them, we would either thrash about aimlessly or be paralyzed by the bewildering mystery of things and events before us. In every situation in our lives we “construct” a response that results from how we are modeling the situation in our minds.

Hence, put us in any situation and we start to give it meaning, to figure it out with the logical structures we have at our disposal. So quickly and automatically do we make inferences — as the result of the way we are modeling the situation in our minds — that we do not typically notice those inferences.

For example, we see dark clouds and infer rain. We hear the door slam and infer someone has arrived. We see a frowning face and infer the person is angry. Our friend is late and we infer she is being inconsiderate. We meet a tall boy and infer he is good at basketball. An Asian and infer he will be good at math. We read a book, and infer what the various sentences and paragraphs, indeed what the whole book, is saying. We listen to what people say, and make a continual series of inferences as to what they mean. As we write we make inferences as to what others will make of what we are writing. We make inferences as to the clarity of what we are saying, as to what needs further explanation, as to what needs exemplification or illustration. We could not do this without “logical structures” by means of which to draw our inferences.

Many of our inferences are justified and reasonable. But, of course, many are not. One of the most important critical thinking skills is the skill of noticing and reconstructing the inferences we make, so that the various ways in which we inferentially shape our experiences become more and more apparent to us. This skill, this sensitivity or ability, enables us to separate our experiences into analyzed parts. We learn to distinguish the raw data of our experience from our interpretations of those data (in other words, from the inferences we are making about them). Eventually we realize that the inferences we make are heavily influenced by our point of view and the assumptions we have made. This puts us in the position of being able to broaden the scope of our outlook, to see situations from more than one point of view, to become more openminded.

This requires that we recognize our point of view as a “logical system” that guides our inferences, a system that we can exchange for another (an alternative point of view), depending on our assumptions.

Often, then, different people make different inferences because they bring to situations a different point of view. They see the data differently. Or, to put it another way, they have different assumptions about what they see. For example, if two people see a man lying in a gutter, one might infer, “There’s a drunken bum.” The other might infer, “There’s a man in need of help.” These inferences are based on different assumptions about the conditions under which people end up in gutters and these assumptions are connected to the point of view about people that each has formed. The first person assumes: “Only drunks are to be found in gutters.” The second person assumes: “People lying in the gutter are in need of help.” The first person may have developed the point of view that people are fundamentally responsible for what happens to them and ought to be able to take care of themselves. The second may have developed the point of view that the problems people have are often caused by forces and events beyond their control. The two are modeling the situation differently. They are using a different system for experiencing it.
In any case, if we want our students to become good reasoners, we must become concerned to help them begin to notice the inferences they are making, the assumptions they are basing those inferences on, and the point of view about the world they are taking — hence the systems in which they are thinking. To help our students do this, we need to give them clear examples of simple cases, and lots and lots of practice analyzing and reconstructing them. For example, we could display the above inferences in the following way:

**Person One:**
Situation: “A man is lying in the gutter.”
Assumption: “Only bums lie in gutters.”
Inference: “That man’s a bum.”

**Person Two:**
Situation: “A man is lying in the gutter.”
Assumption: “Anyone lying in the gutter is in need of help.”
Inference: “That man is in need of help.”

Our goal of sensitizing students to the inferences they make and to the assumptions that underlie their thinking enables them to begin to gain command over their thinking (the way they are using logical structures to model the world). Of course, it may seem odd to put any effort into making explicit such obvious examples. In the harder instances, however, the value of the explanation becomes more evident. In any case, because all human thinking is inferential in nature, and all inferences are embedded in a system, we cannot gain command of our thinking unless we can recognize, one way or another, the inferences embedded in it and the assumptions that underlie it.

Consider the way in which we plan and think our way through everyday events. We think of ourselves as washing up, eating our breakfast, getting ready for work, arriving on time, sitting down at our desks, making plans for lunch, paying bills, engaging in small talk, etc. Another way to put this is to say that we are continually interpreting our actions, giving them meanings — making inferences within a system we have created — about what is going on in our lives.

And this is to say that we must choose among a variety of possible systems for thinking about things. Again, consider some simple cases. As I am sitting in my easy chair, am I “relaxing” or “wasting time”? Am I being “determined” or “stubborn”, or worse, “pig-headed”? Did I “join” the conversation or “butt in”? Is Jack “laughing with me” or “laughing at me”? Am I “helping him” or “being taken advantage of”? Every time I interpret my actions within one of these systems that each word in the language represents, every time I give them a meaning, I make one or more inferences on the basis of one or more assumptions within some point of view.

As humans we continually make assumptions about ourselves, our jobs, our mates, our children, about the world in general. We take some things for granted, simply because we can’t always be questioning everything. Sometimes we take the wrong things for granted. For example, I run off to the store (assuming that I have enough money with me) and arrive to find that I have left my money at home. I assume that I have enough gas in the car only to find that I have run out. I assume that an item marked down in price is a good buy only to find that it was “marked up” before it was “marked down”. I assume that it will not, or that it will, rain. I assume that my car will start when I turn the key and press the starter. I assume that I mean well in my dealings.
with others. We make hundreds of assumptions, use hundreds of concepts, make hundreds of inferences, without noticing that we are doing so. Most of them are quite sound and justifiable. Some however are not.

The question then becomes: "How can we teach our students to begin to recognize the inferences they are making, the assumptions they are basing those inferences on, and the point of view, the perspective on the world that they are beginning to form?" That is, "How can we help students to recognize how they are reasoning about the world?"

♦ Our Students Are Not Learning to Reason Well

Though we are "logic-creating" and "logic-using" animals, we typically operate with little awareness of this fact. We create and apply logical systems without knowing that we are doing so. Our intellectual modeling of the world is done sub rosa, without mindfulness. It is small wonder, then, that we often reason poorly.

Imagine a ballet dancer improving her ballet without knowing that she is a dancer or how and when she is dancing. Imagine a chess player who does not know she is playing chess. Or a tennis player who does not know she is playing tennis. We can hardly imagine people developing these physical and intellectual abilities without high consciousness of how and what they are doing in the doing of it. Yet we expect students to develop the ability to reason well without any mindfulness of the nature of reasoning, the elements of reasoning, or the criteria for assessing reasoning. We expect students to become good reasoners, in other words, without any knowledge of the logic of reasoning. Not surprisingly our approach doesn't work. Most students are very poor reasoners.

What Does Research on Learning and Teaching Tell Us?

By any measure whatsoever, most students are not learning to reason well. A recent summary of research by Mary Kennedy regarding student learning and instruction at the K-12 level documents serious reasoning deficiencies on the part of students.

**Important Research Findings**

**First Finding:** "...national assessments in virtually every subject indicate that, although our students can perform basic skills pretty well, they are not doing well on thinking and reasoning. American students can compute, but they cannot reason.... They can write complete and correct sentences, but they cannot prepare arguments.... Moreover, in international comparisons, American students are falling behind...particularly in those areas that require higher-order thinking.... Our students are not doing well at thinking, reasoning, analyzing, predicting, estimating, or problem solving."

**Second Finding:** "...textbooks in this country typically pay scant attention to big ideas, offer no analysis, and pose no challenging questions. Instead, they provide a tremendous array of information or 'factlets', while they ask questions requiring only that students be able to recite back the same empty list."

**Third Finding:** "Teachers teach most content only for exposure, not for understanding."
Fourth Finding: "Teachers tend to avoid thought-provoking work and activities and stick to predictable routines."

Conclusion: "If we were to describe our current K-12 education system on the basis of these four findings, we would have to say that it provides very little intellectually stimulating work for students, and that it tends to produce students who are not capable of intellectual work."

Fifth Finding: "... our fifth finding from research compounds all the others and makes it harder to change practice: teachers are highly likely to teach in the way they themselves were taught. If your elementary teacher presented mathematics to you as a set of procedural rules with no substantive rationale, then you are likely to think that this is what mathematics is and that this is how mathematics should be studied. And you are likely to teach it in this way. If you studied writing as a set of grammatical rules rather than as a way to organize your thoughts and to communicate ideas to others, then this is what you will think writing is, and you will probably teach it so.... By the time we complete our undergraduate education, we have observed teachers for up to 3,060 days."

Implication: "We are caught in a vicious circle of mediocre practice modeled after mediocre practice, of trivialized knowledge begetting more trivialized knowledge. Unless we find a way out of this circle, we will continue re-creating generations of teachers who re-create generations of students who are not prepared for the technological society we are becoming." (condensed from "Policy Issues in Teaching Education" by Mary Kennedy in the Phi Delta Kappan. May, 91, pp 661-66.)

California State-Wide Test Fiasco: Teachers and Testers Who Don’t Understand Reasoning

Before teachers will be able to help students to reason well, it is essential that they learn what reasoning is and how to assess it. A recent statewide test in California demonstrated that many teachers, and even some educational testing experts, have serious misunderstandings about the nature of reasoning and how to assess it.

The student essay below should have been graded at the lower rather than the higher end of the continuum of eight levels: "minimal evidence of achievement" or, at best, "limited evidence of achievement" rather than the highest grade of "exceptional achievement." For though the essay may have "flair and sparkle" (as one teacher expressed it), it is a poor example of evaluative reasoning, since it systematically confuses the objective goal of reasoned evaluation with the very different goal of explaining subjective preference, an important distinction in critical thinking which the teacher-evaluators apparently missed entirely.

Evaluative Essay Sample

Evaluation. Students were asked to write an evaluative essay, make judgments about the worth of a book, television program, or type of music and then support their judgments with reasons and evidence. Students must consider possible criteria on which to base an evaluation, an-
 einz analyze their subject in light of the criteria, and select evidence that clearly supports their judgments. Each student was assigned one of the following evaluative tasks:

a) To write a letter to a favorite author telling why they especially liked one of the author's books.
b) To explain why they enjoyed one television program more than any others.
c) To justify their preference for a particular type of music.

The tasks made clear that students must argue convincingly for their preferences and not just offer unsupported opinions. This is a sample essay from a student who demonstrated exceptional achievement.

**Rock Around the Clock**

“Well, you're getting to the age when you have to learn to be responsible!” my mother yelled out.

“Yes, but I can't be available all the time to do my appointed chores! I'm only thirteen! I want to be with my friends, to have fun! I don't think that it is fair for me to babysit while you go run your little errands!” I snapped back. I sprinted upstairs to my room before my mother could start another sentence. I turned on my radio and “Shout” was playing. I noted how true the song was and I threw some punches at my pillow. The song ended and “Control” by Janet Jackson came on. I stopped beating my pillow. I suddenly felt at peace with myself. The song had slowed me down. I pondered briefly over all the songs that had helped me to control my feelings. The list was endless. So is my devotion to rock music and pop rock. These songs help me to express my feelings, they make me wind down, and above all they make me feel good. Without this music, I might have turned out to be a violent and grumpy person.

Some of my favorite songs are by Howard Jones, Pet Shop Boys, and Madonna. I especially like songs that have a message in them, such as “Stand by Me”, by Ben E. King. This song tells me to stand by the people I love and to not question them in times of need. Basically this song is telling me to believe in my friends, because they are my friends.

My favorite type of music is rock and pop rock. Without them, there is no way that I could survive mentally. They are with me in times of trouble, and best of all, they are only a step away. (Source: California State Department of Education, 1988. Reprinted in, “California: The State of Assessment”, Anderson, Robert L. Developing Minds, edited by Art Costa, pp. 314–25.)

California classroom teachers wrote comments like these after reading and scoring students' evaluative essays:

- “Evidence of clear thinking was heavily rewarded in our scoring.”

- “I am struck by how much some students can accomplish in 45 minutes; how well they can sometimes marshal the ideas; and with how much flair and sparkle they can express themselves.”
• "More emphasis should be placed on critical thinking skills, supporting judgments, and tying thoughts and ideas together. Far too many papers digress, summarize, underdevelop, or state totally irrelevant facts."

• "Students generally need to develop skills in giving evidence to support their judgments. I plan to spend more time on these thinking skills next year."

First of all, the instructions themselves are confused. They begin with a clear requirement of "objective" evaluation: "Students were asked to write an evaluative essay, make judgments about the worth of a book, television program, or type of music and then support their judgments with reasons and evidence. Students must consider possible criteria on which to base an evaluation, analyze their subject in the light of the criteria, and select evidence that clearly supports their judgments."

Unfortunately, this request for reasoned evaluation is blended in the second half of the instruction with what might possibly be taken, with a little stretching and selective reading, as a request for the expression of a "subjective" preference:

Each student was assigned one of the following evaluative tasks: to write a letter to a favorite author telling why they especially liked one of the author's books, to explain why they enjoyed one television program more than any others, or to justify their preference for a particular type of music. The tasks made clear that students must argue convincingly for their preferences and not just offer unsupported opinions.

Let's look closely at this confusion. In the first place, there is still an emphasis on objective evaluation ("The tasks made clear that students must argue convincingly for their preferences and not just offer unsupported opinions") while the task itself is defined as the justification of a "preference."

Now most people prefer books, television programs, and types of music for fundamentally subjective, not objective, reasons. They like a particular book, television program, or song for no reason other than that they like it, that is, because they enjoy it or find pleasure in it or are interested or absorbed or excited or amused by it. Their reasons for liking what they like are not the result of an objective evaluation. They have no relation to the objective quality of what is judged. They are about the personal responses of the experiencer, not about the objective qualities of that which is experienced.

Most people, to take the point a step further, do not have "evidence" — other than the stuff of their subjective reactions — to justify their preferences. They prefer because of the way they feel not because of the way they reason. To choose because of these subjective states of feeling is precisely to lack criteria of evaluation or evidence that bears upon objective assessment. When challenged to support subjective preferences, people usually can do little more than repeat their subjective reactions ("I find it boring, amusing, exciting, dull, interesting, etc.") or rationalize them ("I find it exciting because it has a lot of action in it.")

A reasoned evaluation of a book, a program, or a type of music requires more than this; it requires some knowledge of the qualities of what we are evaluating and of the criteria appropriate to the evaluation of those qualities. One needs to be well-informed about books, about programs, about music if one is to claim to be in a position to objectively evaluate them. If one is not well-informed, one is unable to render a justified evaluative judgment, though one can always subjectively react and freely express one's subjective reactions as (mere) personal preferences. This is
what the student (graded as having written an objective evaluation of “exceptional achievement”) actually does. But his evaluators, not having this distinction clear in their own minds, completely miss the difference.

The sample student essay can, for analytic purposes, be divided into three parts. We shall comment briefly on each in turn. The first segment of the essay is an account of a highly emotional exchange between the student and his mother:

“Well, you’re getting to the age when you have to learn to be responsible!” my mother yelled out. “Yes, but I can’t be available all the time to do my appointed chores! I’m only thirteen! I want to be with my friends, to have fun!” I don’t think that it is fair for me to baby-sit while you run your little errands!” I snapped back. I sprinted upstairs to my room before my mother could start another sentence.

It is clear that in this segment there is no analysis, no setting out of alternative criteria, no clarification of the question at issue, no hint at reasoning or reasoned evaluation.

In the second part, the student makes a sweeping claim about a purported causal relationship between listening to rock music and his asserted, but unsupported, ability to control his emotions. He does not consider “possible criteria on which to base an evaluation.” He does not present any evidence, though he does cite two examples, one where a song prompts him to punch his pillow and another where another song prompts him to stop. This gives little credence to the notion that rock music leads to his “controlling” his emotions. If anything, his examples seem to imply that, rather than learning control from, he is learning to be controlled by, the music he listens to. His major claim that “Without this music, I might have turned out to be a violent and grumpy person” is without reasoned or evidentiary support. He merely brashly asserts that it is true:

I turned on my radio and “Shout” was playing. I noted how true the song was and I threw some punches at my pillow. The song ended and “Control”, by Janet Jackson came on. I stopped beating my pillow. I suddenly felt at peace with myself. The song had slowed me down. I pondered briefly over all the songs that had helped me to control my feelings. The list was endless. So is my devotion to rock music and pop rock. These songs help me to express my feelings, they make me wind down, and above all they make me feel good. Without this music, I might have turned out to be a violent and grumpy person.

In the third, and final, section of the essay the student closes his remarks with a series of subjective, unsupported, even irrelevant statements:

Some of my favorite songs are by Howard Jones, Pet Shop Boys, and Madonna. I especially like songs that have a message in them, such as “Stand by Me”, by Ben E. King. This song tells me to stand by the people I love and to not question them in time of need. Basically this song is telling me to believe in my friends, because they are my friends.

My favorite type of music is rock and pop rock. Without them, there is no way that I could survive mentally. They are with me in times of trouble, and best of all, they are only a step away.

If this is reasoning, it is very bad reasoning: “Believe in your friends because they are your friends”. “If you feel you cannot survive without rock music, then it follows that you can’t.” Of course, a more appropriate interpretation of what is going on is that the student is not reasoning at all but merely asserting his subjective opinions. Consider, the student doesn’t examine alternative criteria on which to base an evaluation of music. He doesn’t analyze rock music in the
light of evaluative criteria. He doesn’t provide evidence that clearly supports his judgment. His writing is vague where it needs to be precise, logically rambling where it needs to be critically reasoned. We don’t really know what he means by songs “controlling” his feelings. We are not provided with any evidence on the basis of which we could assess whether there is any truth in his sweeping claims about himself, for example, that he could not survive mentally without rock music. Indeed, common sense experience strongly suggests, we believe, that the student is simply deluding himself on this point, or, alternatively, engaging in unbridled hyperbole.

When a blatantly weak essay such as this is disseminated nationally as an example of “exceptional achievement” in the writing of a reasoned evaluative essay, then it is clear that there are large numbers of educators who are not clear about the assessment of reasoning. Remember, the California Assessment Program of the California State Department of Education is the second largest assessment unit in the country. (I should add that Dale Carlson, the head of CAP, is now putting a major effort into rectifying this problem.)

The Many Ways Teachers Mis-Assess Reasoning

If many teachers take bad reasoning to be good, do they also take good reasoning to be bad? Unfortunately the answer appears to be, “Yes.” This became apparent in a Center for Critical Thinking research project in which teachers were provided with a well-reasoned response to the California prompt, in addition to the poorly reasoned one. The participants were teachers enrolled in critical thinking workshops. They were given the two essays to assess after receiving a morning’s instruction on critical thinking. What is significant is the myriad of confusions and misunderstandings about the assessment of reasoning that emerged and the inconsistencies in both grading and in justifying grades.

Here is the “well-reasoned response” they were asked to assess alongside the poorly-reasoned “Rock Around the Clock.”

This second essay (next page) was written by one of the research staff members of the Center who made sure that it was responsive to the directions and displayed all of the critical thinking abilities called for:

1) it distinguished mere subjective preference from well-reasoned assessment,
2) it was responsive to the logic of the question at issue,
3) it formulated and discussed alternative relevant criteria.
4) it distinguished having evidence relevant to a question from lacking such evidence,
5) it displayed intellectual humility,
6) it displayed intellectual integrity,
7) it drew only those conclusions the evidence warranted.

The results highlighted the problem. On one occasion 81 teachers and administrators assessed the two essays. The poorly-reasoned essay was given an average score of 5.4 (out of 8) while the well-reasoned essay was given an average score of 3.9. Forty-nine of the teachers gave the poorly-reasoned essay a 6, 7, or 8, while only 18 teachers gave the well-reasoned essay a 6, 7, or 8.
Can I Prove Rock Music is Better?

It's certainly hard to objectively judge music based on justifiable criteria because most people don't have any real standards for the music they listen to other than they like it. My friends and I are probably no different from other people. We listen to music we like because we like it. But this assignment asks me to give good reasons why we like what we like. I'm not sure I can, but I'll try.

I first wonder what would be a really good reason for liking any kind of music (other than it sounds good to you). Well, I suppose that one possible good reason for preferring one kind of music to another is that it expresses better the problems we face and what we can do to solve those problems.

Does this give me a good reason for preferring rock music to other kinds? Perhaps so. Certainly, rock music is often about problems that we have: problems of love and sex, school and parents, drugs and drink. I'm not sure, however, whether the "answers" in the songs actually are really good answers or just answers that appeal to us. They might even increase our prejudices about parents, teachers, school, and love. I'm not sure.

Another possible good reason for preferring one kind of music to another is that it is written better or more skillfully performed. Can I truthfully say that rock music is more skillfully written or performed than other kinds of music? In all honesty I cannot.

So what is my conclusion? It is this. I am unable to give any objective reason for liking rock music. My friends and I are like most people. We like the music we listen to just because we like it. For better or for worse, that's all the reason we have. What do you think? Can 15 million teenagers be wrong?

Even more illuminating than the raw scores were the reasons given by the teachers and administrators. Multiple confusions surfaced, as I suggested above, about the nature of reasoning and the appropriate way to assess it. Let's look at some of the responses. Try to imagine students actually receiving these grades along with the often mistaken, confused, or unintelligible commentary.

I have divided teacher assessments for convenience into two groups. The first consists of those teachers who grade the poorly reasoned essay higher than the well-reasoned essay. The second consists of those teachers who grade the poorly reasoned essay lower than the well-reasoned essay. Reading the teachers' justifications for their grades reveals a great deal of misunderstanding of the nature of reasoning. [First Essay: "Rock Around the Clock" (the poorly reasoned essay) Second Essay: "Can I Prove Rock Music is Better?" (the well-reasoned essay)]

First Group of Teachers

The following teachers give a high grade to the poorly reasoned essay and a low grade to the well-reasoned essay. In virtually every case, the teachers reveal no awareness of the importance of intellectual humility, wherein one does not claim to justify a conclusion when one lacks the evidence to do so, instead, one gives good reasons for suspending judgment.
1) A Physical Education Teacher: [#1] "The first essay better fulfills the criteria for the assignment because the writer justifies (his or her) preference for a particular type of music. I think I would give it a 7 though because it was kind of confusing how the writer got on the subject.

[#2] "The second essay did not justify a preference for any particular type of music. So the writer did not meet the criteria for the assignment. Strangely enough it was easier to read but possibly because the way the writer feels is how I feel about music in general. I think the essay deserves a '0'."

2) An English Teacher: [#1] "I would give this essay a 7 because he/she gave experience from his/her life to support their opinion — gave reasons and evidence by example.

[#2] "I would give this essay a grade of 2 because he/she did not prove a point — merely rambled from one thing to another searching for a reason."

3) A Math Teacher: [#1] "I would give the first essay a 5 because it did not support the judgment well but did make many references.

[#2] "I would give the second essay a 3 because it is not very evaluative! It did analyze the subject but provided no real support of any judgment."

4) A Math Teacher: [#1] "I would give this paper a grade of 7 because criteria were evident, analysis was good and it had lots of supporting evidence.

[#2] "I would give this paper a 3 because criteria are given but nothing was analyzed and no supporting evidence."

5) Freshman Studies Teacher: [#1] "I would give 'Rock Around the Clock' a grade of 6 because: a) a more flowing style of writing than a series of loosely related points, b) a personal approach, c) specific information as to records and effects of the songs, d) valid and accurate comparisons, e) personalization, f) availability, g) a well-supported point of view, and h) R&R as an avoidance tool.

[#2] "I would give 'Can I Prove Rock Music is Better?' a 3 because a) statement of problem OK, b) no exploration about 'Why we like it', c) discusses what it is about, not why we listen. Do we listen to the words or music?, d) the idea of 'better performances' not followed through on, and e) How do they know they are like 'most people'?"

6) A Math Teacher: [#1] "The first essay: grade 6. The writer has set up some criteria for his choice, the music gives him a calming influence.... Since the writer is given the opportunity to set his own criteria, this will suffice. He gives examples to justify his conclusions.

[#2] "The second essay: grade 3. An attempt is made to give reasons for supporting the music but no conclusions are made. The writer cannot make an argument for his case in any area. It is difficult, as the writer has said, to justify choice or preference, but since one can choose one's own criteria it would seem any position well-argued and justified would fulfill the assignment. The author did not succeed in doing that."

7) Subject Taught Not Identified: [#1] "Rock Around the Clock' Score: 6. This student does not give any clear criteria to start off as to possible criteria to base their evaluation on. This student based their evaluation on how it made them feel or respond. It was based on reactions — not facts to choose music by, but at least this student used something to justify their preference.
[2] “Can I Prove Rock Music Is Better?” Score: 2 Too vague — never really makes a decision about their preference of music. This student talks about possible criteria but never really says anything about it. Shows no support to justify the preference.”

8) Former English Teacher: [#1] “I would give this essay a grade of 8 because: a) essay cites specific examples, b) catchy opening, c) the criteria used was based on student’s personal experience, d) student was asked to justify their preference. I think she did.

[2] “I would give this essay a grade of 2 because: a) very generalized, b) few, if any, concrete examples, c) essay is not personalized to any extent, d) no specific conclusions drawn.”

9) Special Ed. Teacher: [#1] “Point total: 7. This essay listed three criteria on which to base a judgment. It gave examples of each — maybe better examples could be found. The writer attempted to analyze a basically subjective issue in concrete terms — what the songs do for them: not objective, but a fairly concrete assessment of music’s subjectivity.

[2] “Point total: 0. This essay did not seriously attempt to answer the issue at hand. Instead it concluded, quite lamely, that no objective statement of worth could be made. While this may be accurate in the broadest sense, no effort was made to justify that position.”

10) English Teacher: [#1] “I would give this essay a 7 because the author is not afraid to take a stand. Although the ‘proof’ is emotionally based, that was the direction of his/her argument.

[2] “I would give this essay a 3 because the writer was not able to take a position. He/she beats around the bush and asks the reader to make the decision when that was the assignment to the writer. The insecurity and negative attitude runs through the entire paper.”

Second Group of Teachers

The following teachers give a low grade to the poorly reasoned essay and a high or higher grade to the well-reasoned essay. In some cases the teachers revealed some awareness of the importance of intellectual humility. Some are, however, confused or mistaken in part about reasoning and its assessment. For most, thankfully, this confusion is conjoined with some insight into reasoning. For some few others, the fact that they graded the poorly-reasoned essay lower is not based on insight but chance. This is apparent from some of the reasons they give.

1) A Library-Media Teacher: [#1] “Grade: 3 or 4. Reasons: My first thought that it wasn’t a typical essay but rather starts out with a rather clever, attention-getting device. In that sense, the student did catch my attention — and also confused me somewhat. That is, it doesn’t start out as a typical essay. The student is a good writer in that their word choices make sense and there are supporting reasons for why they chose rock music and pop music…. Now that I read this again, I can see that really the writer has only supplied one reason for their selection: the control/ expression of feelings. Well, it’s the same old problem in grading a paper, i.e., the student writes well but hasn’t followed the criteria strictly.

[2] “Grade: 7. Reasons: Just a first critical response before I re-read it. It strikes me as thoughtful and honest (which always impresses me). Now I’ll see how it fits the criteria. The writer states he needs good reasons for his judgment. I don’t think that ‘good’ is the word he wants…. Why do we like what we like? That’s a provocative question!... A quickie, yes, I think they’ve fulfilled most of the criteria, just not in the usual fashion. Also, it’s an essay (as I define one).”
2) A Special Ed. Teacher: [#1] "The student in this essay never really makes a statement that involves an evaluation of a judgment made concerning a type of music, except to say 'My favorite type of music is rock and pop rock. Without them there is no way I could survive mentally.' He does try to show what he means by this statement when he offers examples of music that affect his mood. He lacks a clear evaluation or supportive evidence toward the topic. I think his statement about surviving mentally is a bit much. I give it a 4.

[#2] "This student doesn't know what he thinks and he lets you know it continually. His closing paragraph summarizes what he is trying to put down in the essay and it is the most straightforward part of the essay. His title doesn't quite jibe with the rest of the essay. He was supposed to prove rock music is better, but what he really talked about was whether there was any justification for why people like rock music. I give it a 5."

3) A Social Studies Teacher: [#1] "I would give essay one a grade of 6. Essay number one lists reasons for liking rock music, but it is very superficial in analyzing them in the light of the criteria. It really does not approach the subject in a way that logically lists possible criteria as a basis for analysis and then applies the criteria to the music. The essay is generally Bull Shit with only a general connection to the instructions.

[#2] "I would give essay #2 an 8 because the possible criteria for analyzing the issue are covered...."

4) An English Teacher: [#1] "Score: 3. The writer in essay one has discussed how he/she feels about rock and pop music, but generalities are given and his/her statements aren't supported with evidence. The assignment is to 'justify' preference, not discuss that it makes him/her 'feel good' period. No criteria have been established, so the essay just rambles on about 'feelings' and not much else. Reasons and evidence are lacking.

[#2] "Score: 5. This essay does a little bit better in attempting an argument. The essay establishes two 'criteria' on which to base his/her essay.... Examples of 'answers' in paragraph 3 are needed as evidence.... Paragraph 4 isn't developed. Needs reasons and evidence/examples. Weak Conclusion."

5) A Physical Education Teacher: [#1] "I would grade the essay 0. The essay does not show their judgment about worth with reason and evidence as asked in the directions. There are no criteria for evaluation, analysis with criteria or evidence that clearly supports the judgments.

[#2] "I would grade the essay 5. The essay attempts to set up criteria for evaluation, yet not as completely as it could have been done. There was an attempt to analyze the subject with the criteria, but not complete. There was no evidence to clearly support the judgment."

6) A Second Grade Teacher: [#1] "The first essay should have a 3 because the stated criterion is subjective. The conclusion comes down to, 'I like it because I like it.'

[#2] "The second essay would have a 6 because there was a search for good criteria and no evidence was found to support the good criteria."

7) A Counselor: [#1] "I would give this essay a 1 because the student did select a topic to evaluate which fit the directions. However, she reported her subjective taste (how some songs have affected her, which songs she likes) rather than evaluating 'rock music'.

[#2] "I would give this essay a 7 because: a) she selects an appropriate topic, b) she considered what criteria would be appropriate to evaluate rock music, c) she made judgments based on the criteria she listed, 4) her conclusion was based on her criteria/judgment. However, she might have considered/used other criteria."

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8) A Sixth Grade Language Arts Teacher: [#1] "A grade of 1. There was no evaluation, went strictly by senses.

[#2] "A grade of 8. The writer did a good job on a subject that is a matter of preference no matter how you look at it! He tried to objectively judge rock music, but in the end... 'We like it just because we like it.'"

9) A First Grade Teacher: [#1] "I would give 'Rock Around the Clock' a 4 because the writer did give some facts for liking rock music but wrote mostly from emotion without questioning if her facts were sound. For example, 'believe in my friends because they are my friends'.

[#2] "I would give 'Can I Prove Rock Music is Better?' a 7. The writer stated the purpose, criteria, facts, and gave a conclusion. The writer considered more than just feeling. More facts for liking rock music are needed."

✧ Introduction to the Analysis and Evaluation of Reasoning

There are two obstacles that stand in the way of fostering sound reasoning K–12: 1) teachers must learn how to devise assignments that require reasoning, and 2) teachers must learn how to analyze and evaluate reasoning objectively. This process will not happen overnight, but the sooner it begins, the sooner it can be achieved.

We will shortly take a look at three assignments that call for reasoning as well as at three examples of student work for each of those assignments: student work with no reasoning in it, student work with poor reasoning in it, and student work with good reasoning in it. In each case, we will provide a brief commentary to help make clear what one should look for in the reasoning. But first we will provide a brief overview of what is involved, in general, in the analysis and evaluation of reasoning.

What Is Involved in Analyzing and Evaluating Reasoning?

The fundamental criteria to use in analyzing and evaluating reasoning comes from an analysis of the purpose of the reasoner and the logic of the question or questions raised. For example, if a person raises the question, say, as to whether democracy is failing in the USA (in the light of the dwindling number of people who vote and the growing power of vested interest groups with significant money to expend on campaign contributions), we can establish general criteria for assessing the reasoning by spelling out what in general one would have to do to settle the question. Those criteria would include such matters as the following:

1) An Analysis of the Concept of the Ends of Democracy. What would it be for democracy to succeed? What would it be for it to fail? What do we take the fundamental objective of democracy to be? For democracy to succeed is it enough that it simply ensure the right of the people at large to vote or must it also serve the well being of the people as well?

2) Collection of the Facts About the Numbers of People Not Voting. What is the actual number of people not voting? Is it growing? By what percentage?
3) An Interpretation of the Significance of the Facts Collected in #2. What are the reasons why growing numbers of people are not voting? What are the implications of those facts?

4) Collection of Facts About the Number of Vested Interest Groups Influencing Elections. How many vested interested groups are influencing elections today in comparison to the past? What is the nature and extent of their influence in money spent?

5) An Interpretation of the Significance of the Facts Collected in #4. What is the significance of the growing influence of vested interest groups on election outcomes? What is gained and lost by means of that influence?

6) Synthesis of Numbers 1 through 5. What is the overall significance of what we have found out in 1 through 5? What does it all add up to? What exactly are we gaining and losing as a result of the growing influence of vested interest groups and diminished numbers of voters? In attempting to put everything together we would want to see reflection on this issue from more than one point of view. We would want to assess how the reasoner responds to reasonable objections from other points of view.

These are some of the considerations relevant to reasoning well about the issue. A rational analysis of someone’s response to this issue would involve, then, checking to see if the above considerations were reasonably addressed, to see if the reasoner had done a plausible job in analyzing the functions of democracy, collecting relevant facts and information, interpreting those facts, and putting everything together, with a sensitivity to more than one point of view, into one coherent line of reasoning.

Many of the teachers assessing the reasoning of the essays on rock music above failed to analyze or review the logic of the question at issue. Instead they read the essays impressionistically, allowing the grade they gave to be determined more by whether their impressions were positive or negative than by any close analysis of the degree to which the student responded adequately to the demands inherent in the precise question at issue.

It is the logic of the question at issue which is the “system for thinking” that should guide our reasoning. If we do not develop skill in explicating that logic, our reasoning is apt to become impressionistic, guided by our prejudices and biases, by our egocentrism and ethnocentrism, rather than disciplined by rational considerations.

♦ Three Examples of Student Reasoning

What follows below are three assignments designed to call for reasoning on the part of the students, along with three examples of student “reasoning” in response to those assignments. Two of the assignments are in history and the other in literature. The three issues the students are asked to develop their reasoning on involve: reasoning about the character of the American people, reasoning about the meaning of a poem, and reasoning about the comparative importance of inventions. It would be useful if you thought a little about your own assessment of the students’ reasoning before you looked at ours’. You could then compare the two.
American History: Reasoning About the American Character

Question at Issue: "Are the Americans you know capable of the kind of mass hysteria which occurred in 1919 and is described in a textbook as the ‘Red Scare’?"

Directions: One of the most important reasons to write our history is to discover who we are and who we are not, how we can develop ourselves, what faults we have to watch out for, and what strengths we can build upon. Read the passage in your textbook on the “Red Scare.” Then write a couple of paragraphs in which you try to figure out whether the Americans you know are “capable” or “not capable” of reacting as many Americans did in 1919. (See textbook, p. 731.) Be sure you show us your reasoning. Support and explain why you think as you do.

Reading Excerpt: The “Red Scare”
(from America: Past and Present, by Divine, Breen, Fredrickson, and Williams; Scott, Foresman and Company, 1984, p. 731)

The first and most intense outbreak of national alarm came in 1919. The heightened nationalism of World War I, aimed at achieving unity at the expense of ethnic diversity, found a new target in bolshevism. The Russian Revolution and the triumph of Marxism frightened many Americans. A growing turn into communism among American radicals (especially the foreign-born) accelerated the fears, although the numbers involved were tiny — at most there were sixty thousand Communists in the United States in 1919. But they were located in the cities, and their influence appeared to be magnified with the outbreak of widespread labor unrest.

A general strike in Seattle, a police strike in Boston, and a violent strike in the iron and steel industry thoroughly alarmed the American people in the spring and summer of 1919. A series of bombings led to panic. First the mayor of strike-bound Seattle received a small brown package containing a homemade bomb; then an alert New York postal employee detected sixteen bombs addressed to a variety of famous citizens (including John D. Rockefeller); and finally, on June 2, a bomb shattered the front of Attorney General A. Mitchell Palmer’s home. Although the man who delivered it was blown to pieces, authorities quickly identified him as an Italian anarchist from Philadelphia.

In the ensuing public outcry, Attorney General Palmer led the attack on the alien threat. A Quaker and progressive, Palmer abandoned his earlier liberalism to launch a massive roundup of foreign-born radicals. In a series of raids that began on November 7, federal agents seized suspected anarchists and Communists and held them for deportation with no regard for due process of law. In December, 249 aliens — including such well-known radical leaders as Emma Goldman and Alexander Berkman — were sent to Russia aboard the Buford, dubbed the “Soviet Ark” by the press. Nearly all were innocent of the charges against them. A month later, Palmer rounded up nearly four thousand suspected Communists in a single evening. Federal agents broke into homes, meeting halls, and union offices without search warrants. Many native-born Americans were caught in the dragnet and spent several days in jail before being released; aliens rounded up were deported without hearings or trials.

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For a time, it seemed that this Red Scare reflected the prevailing views of the 
American people. Instead of condemning their government's actions, citizens 
voiced their approval and even urged more drastic steps. One patriot said his so-
tion to the alien problem was simple: "S.O.S. — ship or shoot." General Leonard 
Wood, the army chief of staff, favored placing Bolsheviks on "ships of stone with 
sails of lead," while evangelist Billy Sunday preferred to take "these ornery, wild-
eyed Socialists" and "stand them up before a firing squad and save space on our 
ships." Inflamed by public statements like these, a group of legionnaires in Cen-
tralia, Washington, dragged a radical from the town jail, castrated him, and 
hanged him from a railway bridge. The coroner's report blandly stated that the vic-
tim "jumped off with a rope around his neck and then shot himself full of holes."

The very extremism of the Red Scare led to its rapid demise. Courageous gov-
ernment officials in the Department of Labor insisted on due process and full 
hearing before anyone else was deported. Prominent public leaders began to speak 
out against the acts of terror. Charles Evans Hughes, the defeated GOP candidate 
in 1916, offered to defend six Socialists expelled from the New York legislature; 
Ohio Senator Warren G. Harding, the embodiment of middle-class values, 
expressed his opinion that "too much has been said about bolshevism in America." 
Finally, Palmer himself, with evident presidential ambition, went too far. In April 
1920, he warned of a vast revolution to occur on May 1; the entire New York City 
police force, some eleven thousand strong, was placed on duty. When no bomb-
ings or violence took place on May Day, the public began to react against Palmer's 
hysteria. Despite a violent explosion on Wall Street in September that killed thirty-
three people, the Red Scare died out by the end of 1920. Palmer passed into 
obscurity, the tiny Communist party became torn with factionalism, and the 
American people tried hard to forget their momentary loss of balance.

Student #1

The people I know are not like the people who lived in 1919. They obey the law 
and, though they might make some mistakes or do some things they ought not to, 
they would never hurt someone who was innocent. Most of the people I know go to 
church and believe in God. They are good Christians. They read the Bible. They try 
to raise their children to be good and avoid evil. They are kind people. So I don't 
believe that what happened in 1919 could ever happen again. It won't happen in 
my neighborhood.

Commentary on the Student's Reasoning

There is very little reasoning in this student's work and, on the whole, what there is seems 
uncritical and self-serving: in essence, "My friends are good. Therefore they wouldn't do anything 
bad." There are obvious objections to this reasoning. Presumably, most of the people in 1919 also 
got to church and believed in God. Presumably, they too would have thought themselves to be 
good Christians. Presumably, their friends thought of them as kind and as trying to raise their 
children to be good and to avoid evil. As a result, the student has not really responded to the 
logic of the question which implicitly requires that we think about mass hysteria, how it occurs, 
and how it influences otherwise morally sensitive people to behave in a morally insensitive way.
Student #2

Certainly there are always people who go overboard. That is human nature. And it is unreasonable to think that we will ever abandon human nature. The American people rightly recognized the threat that communism posed to our way of life and fought against it. After all, if we had defeated it then we would not have to have fought the Cold War and spent so much money and resources to defeat the communists after WW II. So what is the lesson. Watch out for human nature. Don’t go overboard. But on the other hand, don’t forget who your enemies are and don’t give up the fight against them just because some people punish them too severely or go to an extreme.

Commentary on the Student’s Reasoning

There is more reasoning in this student’s work, but still not very good reasoning: in essence, “It is human nature for some people to lose control. So (by implication) some of us might do so, but whether or not some of us might act as some people in 1919 did, the people in 1919 were right to fight against communists.” This reasoning is weak because it largely ignores the issue raised. The question at issue is not whether it was right for the people in 1919 to oppose communism, such as it was, in the USA at the time. The question is rather how it came to pass that, as we expressed above, otherwise morally sensitive people came to behave in a morally insensitive way. The student didn’t take this question seriously.

Student #3

It is hard to answer the question as to what anyone is capable of. Perhaps what we are capable of is largely a result of the circumstances we are under. If we assume that all humans share human nature and that because of human nature we are capable of acting out of intense fear or insecurity or hate, then a lot depends upon whether something or someone is able to stir those things up in us. Perhaps, of course, there is a way to raise people so that they have so much good character that even when someone tries to stir up the “worst” in them, they do not give in, they resist the temptation to let their worst side take control of them. The question could then be asked whether I and my friends and neighbors are in the first or the second group. Since we have never been “tested” in a crisis situation, since we have never felt deeply threatened, I don’t think I can honestly say we would pass the test. I don’t know whether we would act like a “Charles Evans Hughes” or a “Billy Sunday.” It’s a scary thought.

Commentary on the Student’s Reasoning

This is better reasoning than in either of the two passages above: in essence, “Everyone has a worse and a better side. Everyone’s worse side can be appealed to. Whether you have the “character” to withstand an appeal to your worse cannot be known until you are “tested.” My friends and I have not been tested. Therefore, we cannot know whether we have the character to withstand such an appeal. Therefore, we don’t know whether we would or would not act as many did in 1919.”
English: Interpreting Poems

**Question At Issue:** What is John Donne saying in his poem “Death Be Not Proud”?

**Directions:** Carefully read the poem below, trying to figure out what the poet is saying. Be careful to explain what your interpretation is and what exactly it is based on. Show us your reasoning. Make sure your interpretation is consistent with (all of) what the poem says.

**Death Be Not Proud**

(John Donne 1572–1631)

Death be not proud, though some have called thee
Mighty and dreadful, for, thou art not soe,
For, those, whom thou think'st, thou dost overthrow,
Die not, poore death, nor yet canst thou kill mee.
Much pleasure, then from thee, much more must flow,
And soonest our best men with thee doe goe,
Rest of their bones, and soules deliverie.
Thou art slave to Fate, Chance, kings, and desperate men,
And dost with poysan, warre, and sickenesse dwell,
And poppie, or charmes can make us sleepe as well,
And better then thy stroake; why swell'st thou then?
One short sleepe past, wee wake eternally,
And death shall be no more; death, thou shalt die.

**Student #1**

I don’t like this poem. It is boring and confusing. The guy does not spell correctly. He talks a lot about death but he does not say anything. I don’t see why he thinks death is mighty or why he thinks it can’t kill him. He says a lot of confusing things. At one time he says it gives pleasure and then talks about bones resting, which makes no sense. Then he talks about flowers and sleeping. Finally he says that death shall be no more and that it shall die. I don’t get it. Why doesn’t he just say what he wants to say? This is a terrible poem. Why do we have to read such stupid stuff?

**Commentary on the Student’s Reasoning**

This student provides us with virtually no reasoning at all. Rather than attempt to figure out what the poet is saying by closely reading what is said, the student rejects the poem, dismisses it emotionally. The result is that the student flagrantly mis-reads the poem and blames his mis-reading on the poem itself and the poet. The student needs to be introduced to the concept of critical reading in which the reader uses the text as evidence to use in interpreting the meaning.

**Student #2**

Mr. Donne says that death should not be proud. It is not mighty or dreadful. He says this because death is like sleep and when you go to sleep you rest. Therefore, because it is restful even the best people sleep, even slaves. And sleeping is better than being poisoned or being sick. Finally, he says that we only sleep a while and then we awake. And then death is gone. In fact, it is dead. He thinks this is good.
Commentary on the Student's Reasoning

There is more reasoning in this student's work but most of it ignores the evidence of what the poem says. The poem does not say or imply, for example, that “because it [death] is restful even the best people sleep, even slaves.” The poem does not say or imply that “sleeping is better than being poisoned or being sick.” Finally, it is clear that the student is not getting the major point of the poem, namely, that because of the promised resurrection, last judgment, and eternal life in heaven or hell, there is a sense in which “death” is not real and lasting, but only something that will “die.” Like the first student, this student also needs to be introduced to the concept of critical reading in which the reader uses the text as evidence in interpreting meaning.

Student #3

It is clear that Donne believes in God or at least in an afterlife. This is implied in the first four lines which I interpret as saying something like this: “Don’t think you’re so powerful because no one really dies but only appears to die” (People who “die” are really just awaiting their resurrection). This interpretation is supported in the next line which implies that what we call death is really a kind of “sleepe” and is not, therefore, very bad. In fact, as he says sleep often gives us “pleasure.” The next lines make a different kind of point but still are a criticism of the view that death is “mighty” and “dreadful.” Death, he says, is not able to control “Fate, Chance, kings, and desperate men.” Furthermore, not only is it not able to control these other forces, it can’t even get away from such unpleasant associates as “poison, warre, and sickness.” Finally, he reasons, narcotics makes us sleep as well as death does and when everyone is resurrected for final judgment (which I infer is what he means) then death itself will be gone forever, and therefore “shalt die.”

Commentary on the Student’s Reasoning

Finally, we have a student who illustrates the process of critical reading, carefully reasoning her way through the poem, using the words of the poem to carefully back up her interpretation.

History: Reasoning About the Significance of Inventions

Question at Issue: “Of two inventions discussed in your textbook, which was the most important and why?”

Directions: The textbook for the course describes a number of important inventions, including those of Gutenberg, Edison, and George Washington Carver. Take two inventions, either from those mentioned in the book or some other inventions you know of, and compare their importance. Defend your answer by giving reasons in favor of your judgment.

Student #1

An invention that is very important is the printing press. It was invented by Johann Gutenberg, who was a man that lived in Germany. He invented the printing press in the Fifteenth Century. The first book ever printed by Gutenberg was the Bible. But he soon printed many other books as well. The first printing press worked by using movable type.

Another important invention mentioned in the textbook was the dehydration of foods. This was invented by George Washington Carver. When you dehydrate foods you take the water out of them. George Washington Carver wanted many people to use his inventions, so he did not take out any patents on them. He made many other inventions besides dehydration. He even thought of more than 300 uses for the peanut, including facial cream, shoe polish, and ice cream.
Both inventions are very important. Many people read books that are printed on a printing press. Many people eat food that has been dehydrated. But to me the printing press was more important than dehydration.

Commentary on the Student’s Reasoning

The student does not provide any reasoning to support his conclusion. He discusses no criteria for assessing inventions for their importance, nor any evidence to support one or the other with respect to those criteria. Most of the factual detail is irrelevant to the issue.

Student #2

R-r-r-r-ring.

The first sound I hear in the morning is my alarm clock going off. It’s an invention I truly hate.

R-r-r-r-ring.

It is not a pretty sound, and as soon as I hear it I feel myself getting angry. If only I didn’t have to get up so early! All my muscles cry out that I want to sleep! Most mornings when I hear that sound, I even cover my ears with my pillow in the hope that I won’t hear it going off.

It is an old-fashioned wind-up alarm clock that loses ten minutes a day. It is not a digital alarm clock because all the digital alarm clocks I’ve ever tried have alarms that are too soft to awaken a really sound sleeper. And believe me I am a very sound sleeper.

R-r-r-r-ring. But no matter what I do, or how I feel, I end up wide awake and out of bed and getting dressed for school.

Once I am awake I look at my other clock, the one that is hanging on the wall over my dresser. It is a great invention too. It’s a digital clock that keeps perfect time. It has a red LED display and it glows in the dark. It has an emergency battery backup, so that even if the electricity cuts out in the night, my wall clock never loses a second.

Which of the two inventions is more important? That’s the question I ask myself as I head off for school. And then the answer comes to me. No matter how perfectly the digital wall clock keeps time, without the alarm clock I wouldn’t be awake to see it. So without doubt the alarm clock wins the prize as most important.

Commentary on the Student’s Reasoning

The student provides some reasoning but when considered closely it is apparent that the reasoning is absurd. The notion that without the alarm clock people would never wake up is ridiculous. What does this student think happened before the alarm clock was invented? Furthermore, does she really think that loud alarms cannot be built into digital clocks? Once again, the student has not learned to think about the logic of the question at issue. Therefore, the student gives no time to reflecting on the general criteria by means of which we might assess the social worth of inventions by relating that worth to the most basic human values, like the preservation of life, the minimization of pain and suffering, the development of a more just society, and so forth. It is only in terms of the concepts of basic human values that criteria can be generated that give a solid logic to the question and hence a means to assess the reasoning which purports to settle the question.

Student #3

Two inventions mentioned in the book are television and the dehydration of food. Each is important in different ways. The television set, for example, affects many people’s lives. I watch television almost every night and so do all of my friends. But it’s not just me and my friends. The same is true for people all across the country, and in most foreign countries as well. Television allows more people
to be entertained than ever possible before. We witness world news, nature programs, comedies and many other programs. Television lets us see much of what is going on in the world.

Dehydration of foods is important in a very different way. The main effects of dehydration are that it allows food to be kept for a long time without spoiling, and to be shipped for a lower cost. I don't know how many people in the world today use dehydrated foods, but I'm pretty sure that it's far smaller than the number of people who enjoy TV. So that seems to show that TV is more important.

And yet I don't feel right saying that one invention is more important than another simply because it has affected more people. If dehydration is used more than it is now, it could help cut down on the number of people who are starving in the world. Saving just a few people from dying of starvation is more important than taking a lot of people and entertaining them.

Commentary on the Student's Reasoning

The student provides some reasoning which might at first appear absurd, but on reflection makes good sense. This student is thinking about the logic of the question at issue and hence is reflecting on the general criteria by means of which we might assess the social worth of inventions by relating that worth to the most basic human values: like the quality or preservation of life, the minimization of pain and suffering, the development of a more just society, and so forth. To say that this student's reasoning is better than the first two students — because she does respond to the logic of the question at issue — does not mean that her reasoning is perfect, for perhaps there are yet further considerations that might be mentioned about the effects of television which might persuade us that television itself is making so large a contribution to the quality or preservation of human life that it is indeed more important than food dehydration. We may know the basic logic of a question without knowing whether we yet have the best answer to that question, the answer that best fulfills its logic.

✦ Conclusion

The whole of this book is concerned with the process of developing students who reason through what they are learning so as to grasp the logic of it, students who know clearly the difference between coming to terms with the logic of something and merely rote memorizing it. But reasoning is not a matter to be learned once and for all. It is a matter of life-long learning, a matter of bringing insightful mindfulness into the fabric of our thinking and our action. For the teacher, it is a matter of learning how to design instruction so that students take command of the logic of their own thinking while they are thinking and through that insightful grasp, improve it.

We figure things out better if we can monitor what we are doing, intellectually, in trying to figure them out, so that we go beyond simply using logical structures, so that we go beyond simply making logical moves, so that we start to intentionally, deliberately, and willfully examine and take apart the logical structures we are using, so that we designedly, purposively, and alertly assess our use of the structures in everyday situations, and, of course, so that we do these things well: clearly, accurately, precisely, etc.

To understand logical structures is to integrate them, to establish logical connections between them, to make it possible for the mind to make an extended series of nuanced inferences, deductions, and derivations. "This is so, therefore that also is so, and that, and that." The logical structures implicit in an educated person's mind are highly systematized. The well-educated person is able to reason quite directly and deliberately, to begin somewhere, know where one is beginning,
and then reason with awareness from that point to other points, all with a given question in mind, with specific evidence in mind, with specific reasons to advance, with specific conclusions to support, with consciousness of one’s point of view and of contrasting points of view. The good reasoner is always reasoning within a system that disciplines and restrains that reasoning.

When the logical structures by which a mind figures out the world are confused, a jumble, a hodgepodge, a mere conglomerate, then that figuring out is radically defective, typically in any of a variety of ways: incomplete, inaccurate, distorted, muddled, inexact, superficial, rigid, inconsistent, and unproductive. Then the mind begins it knows not where, takes things for granted without analysis or questioning, leaps to conclusions without sufficient evidence to back them up, meanders without a consciousness of its point of view or of alternative points of view. Then the mind wanders into its own prejudices and biases, its own egocentricity and sociocentricity. Then the mind is not able to discipline itself by a close analysis of the question at issue and ignores the demands that the logic of that question puts on it and us as rational, logic-creating, logic-using animals.
Content is Thinking: Thinking is Content

A Foundation for the Logic of Teaching

The first and most important insight necessary for the appropriate design of instruction and curriculum is that content is, in the last analysis, nothing more nor less than a mode of thinking. Let me explain.

Historical content is a manifestation of historical thinking. Biological content is a manifestation of biological thinking. Algebraic content is a manifestation of algebraic thinking. There are many ways to begin to grasp the profound truth that all content is nothing more or less than a mode of thinking, a way of figuring something out, a way of understanding something through thought. Here are just three ways of beginning to grasp this truth:

1) All "content" in school is content in a subject. All subjects are areas of study. All areas of study are "things" that we are interested in "figuring out." All fields of study have been advanced insofar as we have discovered ways to figure out whatever is being studied. There is no way to figure out something without thinking. There is no way to learn how to figure something out without learning how to think it through. There is no way to learn mathematical content without learning how to figure out correct answers to mathematical questions and problems. There is no way to learn historical content without learning how to figure out correct or reasonable answers to historical questions and problems. There is no way to learn biological content without learning how to figure out answers to biological questions and problems. Any subject or "content area" can therefore be understood as a mode of figuring out correct or reasonable answers to a certain body of questions. We study chemistry to figure out chemicals (to answer questions about chemicals). We study psychology to figure out human behavior (to answer questions about certain human problems). All subjects can be understood only in this way.

2) All "content" involves concepts. There is no way to learn a body of content without learning the concepts which define and structure it. There is no way to learn a concept without learning how to use it in thinking something through. Hence, to learn the concept of democracy is to learn how to figure out whether some group is functioning democratically or not. To learn the concept of fair play is to learn how to figure out whether someone is being fair in the manner in which they are participating in a game. To learn the concept of a novel is to learn how to distinguish a novel from a play or short story. To learn the concept of a family is to learn how to distinguish a family from a gang or club. To learn any body of content, therefore, it is necessary to learn to think accurately and reasonably with the concepts that define the content.

3) All "content" is logically interdependent. To understand one part of some content requires that we figure out its relation to other parts of that content. For example, we understand what a scientific experiment is only when we understand what a scientific theory is. We under-
stand what a scientific theory is only when we understand what a scientific hypothesis is. We understand what a scientific hypothesis is only when we understand what a scientific prediction is. We understand what a scientific prediction is only when we understand what it is to scientifically test a view. We understand what it is to scientifically test a view only when we understand what a scientific experiment is, etc. To learn any body of content, therefore, is to figure out (i.e., reason or think through) the connections between the parts of that content. There is no learning of the content without this thinking process.

The majority of teachers and students currently approach content, not as a mode of thinking, not as a system for thought, nor even as a system of thought, but rather as a sequence of stuff to be routinely “covered” and committed to memory. When content is approached in this lower order way, there is no basis for intellectual growth, there are no deep structures of knowledge formed, no basis for long term grasp and control.

Critical thinking, in contrast, approaches all content explicitly as thinking. It takes thinking apart. It weaves new thinking into old. It assesses thinking. It applies thinking. It is thinking about thinking while thinking in order to make thinking better: more clear, more accurate, more relevant, more deep, more broad, and more effective.
Using Intellectual Standards to Assess Student Reasoning

To assess student reasoning requires that we focus our attention as teachers on two inter-related dimensions of reasoning. The first dimension consists of the elements of reasoning; the second dimension consists of the universal intellectual standards by which we measure student ability to use, in a skillful way, each of those elements of reasoning.

Elements of reasoning

Once we progress from thought which is purely associational and undisciplined, to thinking which is conceptual and inferential, thinking which attempts in some intelligible way to figure something out, in short, to reasoning, then it is helpful to concentrate on what can be called “the elements of reasoning.” The elements of reasoning are those essential dimensions of reasoning which are present whenever and wherever reasoning occurs. Working together, they shape reasoning and provide a general logic to the use of reason. We can articulate these elements by paying close attention to what is implicit in the act of figuring anything out by the use of reason. These elements, then — purpose, question at issue, assumptions, inferences, implications, point of view, concepts and evidence — constitute a central focus in the assessment of student thinking.

Standards of Reasoning

When we assess student reasoning, we want to evaluate, in a reasonable, defensible, objective way, not just that students are reasoning, but how well they are reasoning. We will be assessing not just that they are using the elements of reasoning, but the degree to which they are using them well, critically, in accord with appropriate intellectual standards.

To assess a student response, whether written or oral, in structured discussion of content or in critical response to reading assignments, by how clearly or completely it states a position, is to assess it on the basis of a standard of reasoning. Similarly, assessing student work by how logically and consistently it defends its position, by how flexible and fair the student is in articulating other points of view, by how significant and realistic the student’s purpose is, by how precisely and deeply the student articulates the question at issue — each of these is an evaluation based on standards of reasoning.

Distinct from such reasoning standards are other standards that teachers sometimes use to assess student work. To evaluate a student response on the basis of how concisely or elegantly it states a position is to use standards that are inappropriate to assessing student reasoning. Similarly, unrelated to the assessment of reasoning is evaluating student work by how humorous, glbt, personal or sincere it is, by how much it agrees with the teacher’s views, by how “well-written” it is, by how exactly it repeats the teacher’s words, by the mere quantity of information it contains. The danger is that such standards are often conflated with reasoning standards, often unconsciously, and students are assessed on grounds other than the degree to which they are
reasoning well.

The basic conditions implicit whenever we gather, conceptualize, apply, analyze, synthesize, or evaluate information — the elements of reasoning — are as follows:

1) Purpose, Goal, or End in View.

Whenever we reason, we reason to some end, to achieve some objective, to satisfy some desire or fulfill some need. One source of problems in student reasoning is traceable to defects at the level of goal, purpose, or end. If the goal is unrealistic, for example, or contradictory to other goals the student has, if it is confused or muddled in some way, then the reasoning used to achieve it is problematic.

A teacher's assessment of student reasoning, then, necessarily involves an assessment of the student's ability to handle the dimension of purpose in accord with relevant intellectual standards. It also involves giving feedback to students about the degree to which their reasoning meets those standards.

Is the student's purpose — in an essay, a research project, an oral report, a discussion — clear? Is the purpose significant or trivial or somewhere in between? Is the student's purpose, according to the most judicious evaluation on the teacher's part, realistic? Is it an achievable purpose? Does the student's overall goal dissolve in the course of the project, does it change, or is it consistent throughout? Does the student have contradictory purposes?

2) Question at Issue, or Problem to be Solved.

Whenever we attempt to reason something out, there is at least one question at issue, at least one problem to be solved. One area of concern for assessing student reasoning, therefore, will be the formulation of the question to be answered or problem to be solved, whether with respect to the student's own reasoning or to that of others.

Assessing skills of mastery of this element of reasoning requires assessing — and giving feedback on — students' ability to formulate a problem in a clear and relevant way. It requires giving students direct commentary on whether the question they are addressing is an important one, whether it is answerable, on whether they understand the requirements for settling the question, for solving the problem.

3) Point of View, or Frame of Reference.

Whenever we reason, we must reason within some point of view or frame of reference. Any "defect" in that point of view or frame of reference is a possible source of problems in the reasoning.

A point of view may be too narrow, too parochial, may be based on false or misleading analogies or metaphors, may contain contradictions, and so forth. It may be restricted or unfair. Alternatively, student reasoning involving articulation of their point of view may meet the relevant standards to a significant degree: their point of view may be broad, flexible, fair; it may be clearly stated and consistently adhered to.

Feedback to students would involve commentary noting both when students meet the stan-
dards and when they fail to meet them. Evaluation of students' ability to handle the dimension of point of view would also appropriately direct students to lines of reasoning that would promote a richer facility in reasoning about and in terms of points of view.

4) The Empirical Dimension of Reasoning.

Whenever we reason, there is some "stuff," some phenomena about which we are reasoning. Any "defect," then, in the experiences, data, evidence, or raw material upon which a person's reasoning is based is a possible source of problems.

Students would be assessed and receive feedback on their ability to give evidence that is gathered and reported clearly, fairly, and accurately. Does the student furnish data at all? Is the data relevant? Is the information adequate for achieving the student's purpose? Is it applied consistently, or does the student distort it to fit her own point of view?

5) The Conceptual Dimension of Reasoning.

All reasoning uses some ideas or concepts and not others. These concepts can include the theories, principles, axioms and rules implicit in our reasoning. Any "defect" in the concepts or ideas of the reasoning is a possible source of problems in student reasoning.

Feedback to students would note whether their understanding of theories and rules was deep or merely superficial. Are the concepts they use in their reasoning clear ones? Are their ideas relevant to the issue at hand, are their principles slanted by their point of view?

6) Assumptions.

All reasoning must begin somewhere, must take some things for granted. Any "defect" in the assumptions or presuppositions with which the reasoning begins is a possible source of problems for students.

Assessing skills of reasoning involves assessing their ability to recognize and articulate their assumptions, again according to the relevant standards. The student's assumptions may be stated clearly or unclearly; the assumptions may be justifiable or unjustifiable, crucial or extraneous, consistent or contradictory.

The feedback students receive from teachers on their ability to meet the relevant standards will be a large factor in the improvement of student reasoning.

7) Implications and Consequences.

No matter where we stop our reasoning, it will always have further implications and consequences. As reasoning develops, statements will logically be entailed by it. Any "defect" in the implications or consequences of our reasoning is a possible source of problems.

The ability to reason well is measured in part by an ability to understand and enunciate the implications and consequences of the reasoning. Students therefore need help in coming to understand both the relevant standards of reasoning out implications and the degree to which their own reasoning meets those standards.
When they spell out the implications of their reasoning, have they succeeded in identifying significant and realistic implications, or have they confined themselves to unimportant and unrealistic ones? Have they enunciated the implications of their views clearly and precisely enough to permit their thinking to be evaluated by the validity of those implications.

8) Inferences.

Reasoning proceeds by steps in which we reason as follows: “Because this is so, that also is so (or probably so),” or “Since this, therefore that.” Any “defect” in such inferences is a possible problem in our reasoning.

Assessment would evaluate students’ ability to make sound inferences in their reasoning. When is an inference sound? When it meets reasonable and relevant standards of inferring. Are the inferences the student draws clear? Are they justifiable? Do they draw deep conclusions or do they stick to the trivial and superficial? Are the conclusions they draw consistent?
Tactics that Encourage Active Learning

Use the following tactics during class to ensure that students are actively engaged in thinking about the content. Students should be called on randomly (using the deck of cards method for instance) so that everyone participates. When students do not know when they will be called on they are much more likely to remain alert and engaged in the learning process. Students should be routinely called upon to:

1. Summarize or put into their own words what the teacher or another student has said.

2. Elaborate on what they have said.

3. Relate the issue or content to their own knowledge and experience.

4. Give examples to clarify or support what they have said.

5. Make connections between related concepts.

6. Restate the instructions or assignment in their own words.

7. State the question at issue.

8. Describe to what extent their point of view on the issue is different from or similar to the point of view of the instructor, other students, the author, etc.

9. Take a few minutes to write down any of the above.

10. Write down the most pressing question on their mind at this point. The instructor then uses the above tactics to help students reason through the questions.

11. Discuss any of the above with a partner and then participate in a group discussion facilitated by the instructor.
A Critical Thinker Considers the Elements of Reasoning

Elements of Reasoning

- Points of View
  frame of reference, perspective, orientation

- Purpose of the Thinking
  goal, objective

- Question at Issue
  problem

- Information
  data, facts, observations, experiences

- Interpretation & Inference
  conclusions, solutions

- Assumptions
  presupposition, taking for granted

- Implications & Consequences

- Concepts
  theories, definitions, axioms, laws, principles, models

With Sensitivity to Universal Intellectual Standards

Clear ➔ Accurate ➔ Deep ➔ Breadth

Precise
Relevant
# Purpose

(All reasoning has a purpose)

**Primary Standards:** 1) Clarity of purpose, 2) Significance of purpose, 3) Achievability of purpose, 4) consistency of purpose

**Common Problems:** 1) Unclear purpose, 2) Trivial purpose, 3) Unrealistic purposes, 4) Contradictory purposes

<table>
<thead>
<tr>
<th>Good Reasoners:</th>
<th>Bad Reasoners:</th>
<th>Feedback to Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>take the time to state their purpose clearly.</td>
<td>are often unclear about their central purpose</td>
<td>(-) You have not made the purpose of your reasoning clear. What are you trying to achieve? Who are you trying to persuade?</td>
</tr>
<tr>
<td>distinguish it from related purposes</td>
<td>oscillate between different sometimes contradictory purposes</td>
<td>(4) You do a good job of distinguishing different but related goals.</td>
</tr>
<tr>
<td>periodically remind themselves of their purpose to determine whether they are straying from it</td>
<td>lose track of their fundamental end or goal</td>
<td>(-) After the second paragraph you seem to wander from your purpose. How do your 3rd and 4th paragraphs relate to your central goal?</td>
</tr>
<tr>
<td>adopt realistic purposes and goals</td>
<td>adopt unrealistic purposes, set unrealistic goals</td>
<td>(4) You make a wise decision not to try to accomplish too much. Accomplishing a little well is almost always better than doing a lot poorly</td>
</tr>
<tr>
<td>choose significant purposes and goals</td>
<td>adopt trivial purposes and goals as if they were significant</td>
<td>(-) Your paper would have been stronger if you had chosen a more important goal.</td>
</tr>
<tr>
<td>choose goals and purposes that are consistent with other goals and purposes they have chosen</td>
<td>inadvertently negate their own purposes, do not monitor their thinking for inconsistent goals</td>
<td>(4) The goal of your paper is worth while and well-chosen.</td>
</tr>
<tr>
<td>adjust their thinking regularly to their purpose</td>
<td>do not adjust their thinking regularly to their purpose</td>
<td>(4) One part of your paper seems to undermine what you are trying to accomplish in another part. You first try to persuade the reader how realistic Dickens' characters are, but after that you seem to be showing that they are caricatures.</td>
</tr>
</tbody>
</table>

(414)
# Question at Issue or Central Problem

(All reasoning is an attempt to figure something out, to settle some question, solve some problem.)

**Primary Standards:** 1) Clarity of Question, 2) Significance of Question, 3) Answerability, 4) Relevance

**Common Problems:** 1) Unclear, 2) Insignificant, 3) Not Answerable, 4) Irrelevant

**Principle:** To settle a question you must understand what it requires.

<table>
<thead>
<tr>
<th>Good Reasoners:</th>
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</tr>
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<tbody>
<tr>
<td>are clear about the question they are trying to settle</td>
<td>are often unclear about the kind of question they are asking</td>
<td>(-) The main question at issue is never made clear.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) You do a good job of clarifying the question at issue.</td>
</tr>
<tr>
<td>can re-express a question in a variety of ways</td>
<td>express questions vaguely and find them difficult to reformulate</td>
<td>(-) You need to reformulate your question in a couple of ways to recognize the complexity of it.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) I like the way you reformulate your question in different ways. It helps the reader see it from different points of view.</td>
</tr>
<tr>
<td>can break a question into sub-questions</td>
<td>are unable to break down the questions they are asking</td>
<td>(+) You do a good job of analyzing the main question into sub-questions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-) It would be easier to solve your main problem if you would break it down somewhat.</td>
</tr>
<tr>
<td>have sensitivity to the kind of question they are asking</td>
<td>have little sensitivity to the kind of question they are asking</td>
<td>(-) You are confusing a legal question with a moral one.</td>
</tr>
<tr>
<td>routinely distinguish questions of different types</td>
<td>confuse questions of different types often respond inappropriately to the questions they ask</td>
<td>(+) You do a good job of keeping the economic issues separate from the social ones.</td>
</tr>
<tr>
<td>distinguish significant from trivial questions</td>
<td>confuse trivial questions with significant ones</td>
<td>(-) You begin with a significant question but seem to wander off into some insignificant ones.</td>
</tr>
<tr>
<td>distinguish relevant questions from irrelevant ones</td>
<td>confuse irrelevant questions with relevant ones</td>
<td>(+) The problem you raise is a very significant one.</td>
</tr>
<tr>
<td>are sensitive to the assumptions built into the questions they ask</td>
<td>often ask loaded questions</td>
<td>(-) The way you put the question is loaded. You are taking for granted from the outset the correctness of your own position.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) You put your question in a neutral and unbiased form.</td>
</tr>
<tr>
<td>distinguish questions they can answer from questions they can't</td>
<td>try to answer questions they are not in a position to answer.</td>
<td>(+) You were correct in leaving that question unanswered, and in recognizing what extra information you would need to answer the question.</td>
</tr>
</tbody>
</table>
Point of View
(All reasoning is done from some point of view.)

**Primary Standards:** 1) Flexibility in Point of View, 2) Fairness of Point of View, 3) Clarity of Point of View, 4) Breadth of Point of View

**Common Problems:** 1) Restricted, 2) Biased, 3) Unclear, 4) Narrow

**Principle:** Reasoning is better when multiple, relevant points of view are sought out, articulated clearly, empathized with fairly and logically, applied consistently and dispassionately.

<table>
<thead>
<tr>
<th>Good Reasoners:</th>
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</tr>
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<tbody>
<tr>
<td>keep in mind that people have different points of view, especially on controversial issues</td>
<td>don’t realize that people approach the question at issue from different points of view</td>
<td>(-) You haven’t articulated the point of view from which you are approaching this issue.</td>
</tr>
</tbody>
</table>
| consistently articulate other points of view and reason from within those points of view | cannot see issues from points of view that are significantly different from their own; cannot reason with empathy from alien points of view | (+) You have reasoned out this controversial issue clearly from multiple relevant points of view. 
(-) You have characterized your own point of view, but what are the most significant aspects of the problem from X’s point of view? |
| seek other viewpoints especially when the issue is one they believe in passionately | can sometimes give other points of view when the issue is not emotionally charged, but cannot do so for issues they are deeply committed to | (+) You have done an excellent job of spelling out the other side of this issue. This is especially difficult when a person is as deeply committed to one side as you are.
(-) This is an unfair way of presenting X’s point of view. |
| confine their monological reasoning to problems that are clearly monological | confuse multilogical with monological issues, insist that there is only one frame of reference within which a given multilogical question must be decided | (-) Is the question here monological or multilogical? How can you tell?
(-) You are reasoning as if only one point of view is relevant to this issue. |
| recognize when they are most likely to be prejudiced | are unaware of their own prejudices | (+/-) Is this prejudice or reasoned judgment? |
| approach problems and issues with a richness of vision and an appropriately broad point of view | reason from within inappropriately narrow or superficial points of view | (-) Your approach to this question is too narrow.
(+) You have considered this problem with the depth it requires. |
Empirical Dimension
(All reasoning is based on data, information, evidence.)

**Primary Standards:** 1) Clear Evidence, 2) Relevant Information, 3) Fairly Gathered and Reported Evidence, 4) Accurate Data, 5) Adequate Evidence, 6) Consistently Applied Data

**Common Problems:** 1) Unclear, 2) Irrelevant, 3) Biased, 4) Inaccurate, 4) Insufficient, 6) Inconsistently applied

**Principle:** Reasoning can only be as sound as the evidence it is based on.

<table>
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<tbody>
<tr>
<td>assert a claim only when they have sufficient evidence to back it up</td>
<td>assert claims without considering any evidence</td>
<td>(+) This is a clear statement of the relevant data.</td>
</tr>
<tr>
<td>can articulate and therefore evaluate the evidence behind their claims</td>
<td>don't articulate their evidence even when they have it, and so do not subject it to rational scrutiny</td>
<td>(-) This claim can't merely be asserted but must be supported by evidence.</td>
</tr>
<tr>
<td>actively search for information against (not just for) their own position</td>
<td>gather evidence only when it supports their own point of view</td>
<td>(-) I think you probably have evidence to support your claim here; you just haven't articulated it.</td>
</tr>
<tr>
<td>focus on relevant information and disregard what is irrelevant to the question at issue</td>
<td>do not carefully distinguish between relevant data and irrelevant data</td>
<td>(+) You have gathered and reported evidence fairly on both sides of this issue.</td>
</tr>
<tr>
<td>draw conclusions only to the extent that they are supported by the data</td>
<td>make inferences that go beyond what the data support</td>
<td>(-) Where is a good place to look for evidence on the opposite side? Have you looked there?</td>
</tr>
<tr>
<td>state their evidence clearly and fairly</td>
<td>distort the data, or state it inaccurately</td>
<td>(+) This is a clear and coherent presentation of the pertinent information.</td>
</tr>
</tbody>
</table>
# Concepts and Ideas

(All reasoning is expressed through, and shaped by, concepts and ideas.)

**Primary Standards:** 1) Clarity of Concepts, 2) Relevance of Concepts, 3) Depth of Concepts, 4) Neutrality of Concepts

**Common Problems:** 1) Unclear, 2) Irrelevant, 3) Superficial, 4) Biased

**Principle:** Reasoning can only be as clear, relevant, and deep as the concepts which shape it.

<table>
<thead>
<tr>
<th>Good Reasoners: are aware of the key concepts and ideas they use</th>
<th>Bad Reasoners: are unaware of the key concepts and ideas they use</th>
<th>Feedback to Students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>are able to explain the basic implications of the key words and phrases they use</td>
<td>do not accurately explain basic implications of their key words and phrases</td>
<td>(+) The concept of democracy, central to your essay, is not analyzed in your paper. You assume that if people are in any sense allowed to vote, they are living in a democracy. You need to consider the idea of democracy more deeply.</td>
</tr>
<tr>
<td>are able to distinguish special, non-standard uses of words from standard uses</td>
<td>are not able to recognize when their use of a word or phrase departs from educated usage</td>
<td>(+) Yes, the word ‘cunning’ has negative implications that the word ‘clever’ does not.</td>
</tr>
<tr>
<td>are aware of irrelevant concepts and ideas use concepts and ideas in ways relevant to their functions</td>
<td>use concepts in ways inappropriate to the subject or issue</td>
<td>(-) Where did you get your definition of this central concept?</td>
</tr>
</tbody>
</table>

(-) You assume that abortion is murder, but you won’t find a dictionary that defines it as “the murder of a very young person”. Don’t put your conclusion into the definition.

(+/-) Do you think that the notion of ‘dog-eat-dog’ applies to moral situations? Isn’t the question one of moral responsibility?
Assumptions
(All reasoning is based on assumptions.)

**Primary Standards:** 1) Clarity of Assumptions, 2) Justifiability of Assumptions, 3) Consistency of Assumptions

**Common Problems:** 1) Unclear, 2) Unjustified, 3) Contradictory

**Principle:** Reasoning can only be as sound as the assumptions it is based on.

<table>
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<th>Good Reasoners:</th>
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</thead>
<tbody>
<tr>
<td>make assumptions that are clear</td>
<td>often make assumptions that are unclear</td>
<td>(-) It is not clear what you are assuming.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-) It is not clear what you base your main assumption on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) Your assumptions seem clear and reasonable.</td>
</tr>
<tr>
<td>make assumptions that are reasonable</td>
<td>often make unjustified or unreasonable assumptions</td>
<td>(-) It seems unreasonable to make assumptions about the future based on just one experience from the past.</td>
</tr>
<tr>
<td>make assumptions that are consistent with each other</td>
<td>often make assumptions that are contradictory</td>
<td>(-) The assumptions you make in the first part of your paper seem to contradict the assumptions you make in the last section of your paper.</td>
</tr>
</tbody>
</table>
# Implications and Consequences

(All reasoning leads somewhere, has implications and consequences.)

**Primary Standards:** 1) Significance of Implications, 2) Realistic Nature of Implications, 3) Clarity of Articulated Implications, 4) Precision of Articulated Implications, 5) Completeness of Articulated Implications

**Common Problems:** 1) Unimportant, 2) Unrealistic, 3) Unclear, 4) Imprecise, 5) Incomplete

**Principle:** To reason through an issue or decision, you must understand the implications and consequences that follow from it.

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<tbody>
<tr>
<td>trace out a number of significant implications and consequences of their reasoning</td>
<td>trace out few or none of the implications and consequences of holding a position or making a decision</td>
<td>(-) You don't spell out the consequences of the action you are advocating.</td>
</tr>
<tr>
<td>articulate the implications and consequences clearly and precisely</td>
<td>are unclear and imprecise in the consequences they articulate</td>
<td>(-) If you took this course of action, what other consequences would follow?</td>
</tr>
<tr>
<td>search for negative as well as for positive consequences</td>
<td>trace out only the consequences they had in mind at the beginning, either positive or negative, but usually not both</td>
<td>(+) You have spelled out the implications of your reasoning in as clear and precise a way as the subject permits.</td>
</tr>
<tr>
<td>anticipate the likelihood of unexpected negative and positive implications</td>
<td>are surprised when their decisions have unexpected consequences</td>
<td>(-) You've done a good job of spelling out some positive consequences of the decision at issue, but what are some of the negative consequences?</td>
</tr>
</tbody>
</table>

(+) In addition to the ones you've traced out, there are several important consequences you've missed.

(-) Would other factors in the decision lead to significant consequences you left out?
Inference & Conclusion

(All reasoning contains inferences by which we draw conclusions and give meaning to data.)

**Primary Standards:** 1) Clarity of Inferences, 2) Justifiability of Inferences, 3) Prodigity of Conclusions, 4) Reasonability of Conclusions, 5) Consistency of Conclusions

**Common Problems:** 1) Unclear, 2) Unjustified, 3) Superficial, 4) Unreasonable, 5) Contradictory

**Principle:** Reasoning can only be as sound as the inferences it makes and conclusions it comes to.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>make inferences that are clear and</td>
<td>often make inferences that are</td>
<td>(-) It is not clear what your main conclusion is.</td>
</tr>
<tr>
<td>precise</td>
<td>unclear</td>
<td>(-) It is not clear what you base your main conclusion on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(+) Your reasoning is very clear and easy to follow.</td>
</tr>
<tr>
<td></td>
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<tr>
<td>usually make inferences that</td>
<td>often make inferences that do not</td>
<td>(-) The conclusion you come to does not follow from the</td>
</tr>
<tr>
<td>follow from the evidence or reasons</td>
<td>follow from the evidence or reasons</td>
<td>reasons presented.</td>
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<tr>
<td>presented</td>
<td>presented</td>
<td>(+) You justify your conclusion well with supporting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>evidence and good reasons.</td>
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<tr>
<td>often make inferences that are</td>
<td>often make inferences that are</td>
<td>(+) Your central conclusion is well-thought-out and goes</td>
</tr>
<tr>
<td>deep rather than superficial</td>
<td>superficial</td>
<td>right to the heart of the issue.</td>
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<td></td>
<td></td>
<td>(-) Your conclusion is justified, but it seems superficial,</td>
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<td></td>
<td>given the problem.</td>
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<tr>
<td>often make inferences or come to</td>
<td>often make inferences or come to</td>
<td>(-) It is unreasonable to infer a person's personality</td>
</tr>
<tr>
<td>conclusions that are reasonable</td>
<td>conclusions that are unreasonable</td>
<td>from one action.</td>
</tr>
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</tr>
<tr>
<td>make inferences or come to</td>
<td>often make inferences or come to</td>
<td>(-) The conclusions you come to in the first part of your</td>
</tr>
<tr>
<td>conclusions that are consistent</td>
<td>conclusions that are contradictory</td>
<td>paper seem to contradict the conclusions that you come</td>
</tr>
<tr>
<td>with each other</td>
<td></td>
<td>to at the end.</td>
</tr>
</tbody>
</table>
Recommended Readings in Critical Thinking

The General Case for Critical Thinking


Critical Thinking Pedagogy


Appendix


*College Textbooks (Not Focused on a Specific Discipline)*


*Science and Critical Thinking*


**Mathematics and Critical Thinking**


**Language Arts and Critical Thinking**


**Critical Thinking and the Media**


**Also of Interest**


