Appendix B: Detailed Definitions of the Critical Thinking Process Framework

Introductory Caveats to Instructors

A. To understand critical thinking we need to recognize that it is a process made up of many sub-skills. Those sub-skills may take on different titles and meanings across disciplines. For a given title shown below, definitions from some disciplines are very broad while others are quite specific. Some are inclusive while others are nuanced. So the titles and definitions listed below may resonate with some faculty and not with others. I have attempted to find the most common titles and definitions and I’ve tried to point out where major differences may exist across disciplines.

B. Almost any of the “sub-skills listed below can be reframed as a process made up of other sub-skills found within this list. For example, the word evaluation denotes a specific mental process related to passing judgment. However, performing an evaluation project would require most of the other thinking skills listed below. Thus, the language we use for describing thinking is mushy at best. When in doubt, use your own language.

C. The list shown below is not exhaustive. There are hundreds of other terms that are related to each of the sub-skills listed below. I have attempted to list a few of the more common related terms.

Prerequisite Skills: Dispositions or Critical Spirit

Dispositions or a Critical Spirit are a nebulous and often undefined set of beliefs, aspirations, feelings, desires, etc. Simply put, a proper mental mindset is a prerequisite to true critical thinking. The thinker has to want to think critically about something to avoid taking the easier routes forward. Dispositions or what some call a critical spirit encompass our motivations and our nature toward thinking rather than denoting a specific thinking skill.

Caution: This sub-skill is a prerequisite to true critical thinking rather than a first step in the critical thinking process. Most authors suggest that one must be purposeful and should maintain a level of open-mindedness to allow for critical thinking to occur. It is extremely difficult to measure dispositions. In most cases, we can collect indirect evidence that suggest a thinker’s motivations or beliefs.

Related terms include such things as decentering, flexibility, objectivity, honesty, truth seeking, fairness, maturity, willingness to suspend judgment, etc.

1. Interpretation

The primary definition of interpretation is the act of making sense of various inputs. The inputs may include such things as arguments, evidence, statements, ideas, concepts, graphics, pictures, questions, problems, situations, beliefs, etc. For example, at a very simple level, the ability to read and understand a text would be a form of interpretation. At a more complex level, the ability to interpret the message of a political cartoon would also qualify as interpretation.
Interpretation does have other meanings related to outputs. For some, it is the artist’s ability to place a personal touch to a piece. Still others see interpretation as a production task in writing where the writer’s approach and framing illustrate their thoughts about the subject at hand. To avoid confusion, we will not use either of these definitions here. Both of these production definitions will fall under communication instead.

**Caution:** Interpretation is very similar to analysis in many ways. Both deal with making meaning of various inputs. But interpretation is making sense of what is given while analysis suggests the brain manipulate, process, or otherwise make active changes to the inputs to make better sense of the materials.

Interpretation - To comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria (Facione, 2011).

Sub-skills and Related Terms
- **Clarifying Understanding**
- **Comprehension**
- **Critical Reading**
- **Decoding**
- **Finding Significance**

*Bolded* terms are consistent with the Delphi study of critical thinking (Facione, 1990).

**Clarifying Understanding**
Although this skill is often a subpart of many other skills in this document, it is called out here to show the wide variety of sub-skills connected to clarification activities. When reviewing materials the thinker makes sense of the input.

*Related terms* include such things as understanding, recognizing issues and nuances, consideration, or finding main and related ideas.

**Comprehension**
The term comprehension is perhaps synonymous with understanding. Comprehension assumes actively engagement by the thinker with the elements found in materials or events. In reading instruction and testing the term comprehension holds a specific meaning in that the thinking is limited to what is found within the written text. Thus, comprehension may be a sub-set of the larger term interpretation. Compare with *critical reading*.

**Critical Reading**
Evaluating, interpreting, and reflecting upon a given text. Critical readers consider how/why the text was written versus what was said. Colloquially, this term is sometimes known as reading between the lines or clarifying meaning. Contrast critical reading with
reading comprehension which determines if an individual understood the actual words, concepts presented, and other things found within a reading passage.

**Decoding & Finding Significance**

The term decoding simply means the act of making meaning from complex inputs such as source documents, videos, events, etc. Decoding is different than the skills listed above in that it demands a conversion from one form to another. For example, translating foreign words into English, seeing the meaning of mathematical equation conventions, or even recognizing nonverbal communications would fit here. Decoding is a precursor to analysis in that one must first fully understand the messages presented. The word decoding has a special meaning to reading teachers. We will not use that definition here.

2. **Analysis**

The most common definition of analysis is the act of breaking a complex construct, situation, or other entity into component parts to aid understanding. However, analysis is an enormous construct that comes in many forms when it is connected to reading, viewing, or listening (inputs) such as recognizing relationships, listing constraints and assumptions, finding ideas within a work, considering diverse perspectives, identifying implications or consequences, discriminating, etc. Analysis is often paired with other skills such as evaluation and judgment to aid deconstruction.

*Related terms* may include such things as consideration, investigation, looking deeply at issues, comparing, contrasting, reasoning, and many others.

**Caution**: Analysis is similar to interpretation and evaluation in terms of some of the thinking patterns involved. However, analysis goes beyond interpretation by working with materials to improve sense making and stops short of evaluation in that the thinker does not yet place value or render judgments about the materials at hand. Although our thinking is actually not this linear, think of analysis for our purposes as sandwiched between understanding material (inputs) and assessing or making value judgments about the material.

Identify relationships among and between statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions (Facione, 2011).

**Sub-skills and Related Terms**

- **Categorization**
- **Classification**
- **Deconstruction**
- **Identify and Examine**
  - Arguments
  - Assumptions
  - Connections
  - Concepts
  - Ideas
  - Reasons and Claims
  - Voice, Subjectivity, Agenda, Bias
• Considering Diverse Perspectives

**Bolded terms** are consistent with the Delphi study of critical thinking.

**Categorization**

The skill of identifying a set of categories from a complex milieu and the ability to place information, objects, items, etc. into categories based on certain criteria. Sub-skills in categorization include such things as the ability to identify relationships, similarities, differences, find potential categories for grouping data, and then organizing information into those categories to aid communication or inference. Related skills include interpretation, abstraction, combination, simplification, analysis, and summarization.

**Classification**

This skill is very similar to categorization however for our purposes classification assumes a hierarchy or scale among the component parts. For example, classifying life forms uses a highly specialized and pre-determined set of categories.

**Deconstruction**

Deconstruction means actively breaking complex issues down into component parts to aid understanding or to make new meaning of materials.

**Identifying Connections**

Connecting one abstract construct to another, or connecting an abstract construct (e.g., theory) to a real-world event. In addition, some disciplines use this term for the act of integrating knowledge from disparate sources (e.g., learning from humanities can inform learning in another discipline). (See also: Making Connections under Inference.)

**Identifying Arguments**

This sub-skill is similar in form to most of the others in the list under analysis. However, the fodder for this sub-skill is quite specific. The thinker in this case is working with determining the author’s position, claims, or message and finding the reasons, evidence, etc. that support the argument. In other words, the thinker figures out what the author has to say and begins to see the reasons why.

*Related terms* include finding claims, determining the author’s purpose or main ideas, etc.

**Considering Diverse Perspectives**

This skill has to do with openly considering an issue from different perspectives or points of view. It includes the ability to identify bias in self, others, and in materials. The origin for this sort of critical thinking may be an awareness or internal impetus to seek out others’ ideas. Terms for this internal locus include open-mindedness, empathy, dedication to fairness and social justice, maturity, or even the elements of the critical spirit.
While considering perspectives is often done as a part of reviewing source materials, personal reflection, or problem solving, the ability to see and articulate perspectives is considered a separate skill by some disciplines. For human relationships, the term “decentering” is used to denote the ability to stand outside ourselves to objectively view a situation from another person’s perspective.

*Related terms include* creativity, thinking outside the box, looking through another person’s eyes, open-mindedness, and reframing.

### 3. Evaluation

Evaluation is the skill of determining merit, efficacy, advantages, worth, authenticity, validity, impact, or significance, of something (e.g., evidence, sources, assumptions, etc.).

Some disciplines consider the evaluation of source materials as a wholly different construct and place the skill within information literacy rather than critical thinking. Some disciplines separate elements of reviewing source materials into phases of understanding (interpretation), categorization, clarification of meaning, and other skills.

*Related terms* include assessment, criteria construction, and judgment.

**Caution:** Evaluation normally leads to rating, value statements, and decision making. However, for our purposes, evaluation must be limited to the sub-skills listed below and should not be confounded with outcomes of the evaluation. Making a “good” decision may involve evaluation. But a good decision is not necessarily dependent on evaluation, so can’t be a surrogate for “good” evaluation skills. For example, an expert makes unconscious “good” decisions based on experience rather than any sort of evaluation or other critical thinking.

To assess the credibility of statements or other representations which are accounts or descriptions of a person’s perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions, or other forms of representation (Facione 2011).

**Sub-skills and Related Terms**

- **Assess**
  - Credibility
  - Quality
  - Relevance
  - Etc.
- Judgment
- Using Inductive or Deductive Reasoning

**Bolded terms** are consistent with the Delphi study of critical thinking.

**Assessment**

At the heart of evaluation is the ability to assess, claims, arguments, situations, beliefs etc. in terms of their credibility, quality, relevance, and other similar factors. This sort of thinking is
the act of placing value to facilitate subsequent thinking. Some authors place assessment of information sources here while others move this specific sub-skill under Information Literacy.

Unfortunately, thinkers often place value subconsciously rather than actively evaluating and deciding on value explicitly. For example, a bigoted person might discount opinions or ideas from authors of another social group without even reading, much less understanding the messages involved. Thus, assessment in the critical thinking sense demands a strong dispositional component to make fair judgments.

Related terms include weighing the evidence, considering the issues, open mindedness, explicit decision making, suspending judgment, etc.

**Judgment**

This sub-skill is a mix of evaluation and decision making. Often, it is limited to the use of evidence in making a decision whereas “decision making” might be a broader construct. Judgment in various professions could be founded on emotion, bias, or codified standards external to the individual. Note that this term has special meaning in mathematics (assertions).

**4. Inference**

Inference is easily and specifically defined as coming to a conclusion, or making decisions, deductions, assumptions, etc., based on the evidence at hand. This sub-skill represents the result of critical thinking. While easily defined, many sub-skills are necessarily involved that go beyond such things as analysis and evaluation.

There are more specific meanings to inference in some disciplines such as statistics, where assumptions about a population are made from a small sample of evidence or in various sciences where hypothesis testing is necessary.

Related terms include confirmation, deduction, determining implications, identifying potential consequences, inquiry, supposition, etc.

To identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation (Facione 2011).

Sub-skills and Related Terms
- Causal Modeling
- **Conjecturing Alternatives**
- Decision Making
- **Drawing Conclusions**
- Generalization
- Making Connections
- Planning
Causal Modeling
This skill is the act of thinking-through or otherwise using a causal model. A causal model is a representation of real-world relationships, dynamic, and/or connections among variables. Causal models are used to examine cause and effect, chronological relationships, and processes. These uses often result in making predictions (running the causal model forward), determining root causes (diagnosing or running the causal model backward), or identifying errors. Because causal modeling has various interpretations, it can look identical to planning (see Conjecturing Alternatives above), prediction (see Drawing Conclusions above), decision making, etc.

Conjecturing Alternatives
On first glance this sub-skill seems to fit earlier in the critical thinking process. However, it is placed here underneath inference because coming up with alternatives involves integrated reasoning and decision making. For example, the thinker may need to come up with plan A, B, and C to allow for contingencies.

Decision Making
Although the phrase “decision making” is a large process in its own right, the more specific act of making a decision fits well into inference. Like drawing conclusions, decision making assumes the use of various sub-skills of critical thinking that precede this section.

Drawing Conclusions
This sub-skill is simply defined as the endpoint of using Inference (see the Inference section - above). The thinker uses evidence, ideas, beliefs, etc. to come to closure in one form or another (e.g., opinions, positions, arguments, choices, decisions, etc.).

Generalization
Generalization is the inference of specific rules, conclusions, principles, broad statements, etc. It is perhaps a sub-part of Drawing Conclusions in that it is a specific method for using evidence from a small sample to a larger population. For example, the thinker may use the results of three lab experiments to generalize a rule about the boiling point of water or may use a few past experiences to make broad comments about an issue. In this sense, generalizations can be under or over stated based on the sufficiency of the evidence at hand.

Making Connections
Connecting one abstract construct to another, or connecting an abstract construct (e.g., theory) to a real-world event. In addition, some disciplines use this term for the act of
integrating knowledge from disparate sources (e.g., learning from humanities can inform learning in another discipline). {See also: Identifying Connections under Analysis.}

Planning
The organization of ideas, steps, etc. for guiding future events. See also, Causal Modeling.

*Related terms* include design, projecting, scheduling, logistics, etc.

Prediction
Prediction has to do with using often incomplete data to determine future events. Prediction often utilizes causal modeling, analysis, evaluation, decision making, etc.

*Related terms* include forecasting.

Reasoning
This term is a *very large construct* that includes much of what is in this entire document. As such, reasoning could fit under many of the headings. Reasoning can be limited to inductive or deductive thought. Or, it could be expanded to include any sort of deep thinking or “thinking through” something that begins with such things as examining assumptions or identifying perspectives then ends with such things as explanations, justifications, or predictions. The end product of reasoning could be a conclusion or position; but could also look much like making a decision or solving a problem.

Reasoning is placed here underneath *Inference* because we will use a specific definition based on the use of logic for considering issues. Inductive reasoning (making general conclusions from specific evidence or deveining principles from facts) as well as deductive reasoning (moving from general to specific or principle to instantiation) are both fair game.

5. Explanation
Now it is time in the critical thinking process to communicate all that has come before. Thinkers must organize their thoughts and feelings in ways that illustrates their thinking and communicates their meaning. The thinking behind the resulting narrative, report, picture, or other representation is what matters here.

*Related terms* may include clarification, description, portrayal, excerpting (or abstracting) information, etc.

**Caution:** The point to this last sub-skill is the ability to communicate well. All of the previously listed sub-skills are separate and distinct in that there might be strong explanation yet faulty reasoning involved. Thus this sub-skill has more to do with how well a narrative is written than what it is saying. When measuring this sub-skill ensure that graders understand the difference between the traits of good explanation versus what is good about the previous sub-skills discussed earlier in this document. So why is this still considered critical thinking? Let’s take
writing traits as an example. Traits include such things as Consideration of Audience, Content Development, Use of Evidence, etc. Clearly, the writer must do a fair bit of critical thinking to succeed with these traits. Therefore we recommend using both pure critical thinking measures for the sub-skills discussed earlier as well as trait measures showing how well the narrative or other submission communicated.

To present in a cogent and coherent way the results of one’s reasoning. This includes stating and justifying the reasoning in terms of the evidential, conceptual, methodological, criteriological, and contextual considerations upon which one’s results were based; and to present one’s reasoning in the form of cogent arguments (Facione 2011).

Sub-skills and Related Terms
- Abstraction
- Argumentation
- Integration
- Justify Procedures (based on evidence)
- Present Arguments
- State Results
- Summarization
- Synthesis

Bolded terms are consistent with the Delphi study of critical thinking.

Argumentation

The term argument is most often defined as the ability to construct reasons for a position or to support a conclusion. In writing, the term argument may relate to the ability to persuasively explain a point of view, position, decision, etc.

Like most of the other terms related to critical thinking, it is similar, a part of, or a super-set to terms like logical reasoning, mathematical proofs, analysis, evaluation, prioritization, organization, justification, explanation, prediction, presentation of evidence, use of examples, etc.

Synthesis

Organizing, assembling, or otherwise combining variables, issues, etc. into a coherent whole.

6. Metacognition for Self-regulation

This skill is not a linear step in the critical thinking path. Rather, it is a special form of critical thinking that is related, but uses different sorts of thinking and has different goals.

To self-consciously monitor and control one’s own cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis and evaluation to one’s own inferential judgments with a view toward questioning, confirming, validating, or correcting either one’s reasoning or one’s results (Facione 2011).

Sub-skills and Related Terms
- Self-monitoring
- Reflection
- Self-correction

Bolded terms are consistent with the Delphi study of critical thinking.
This is another large construct with various definitions. The construct has been defined as thinking about thinking (thinking about thinking and self-awareness), thinking about personal knowledge and learning (knowing about knowing and epistemic awareness) and stepping outside automatic thoughts and actions to monitor and regulate thinking/learning (executive management and control of cognition).

Related terms include self-directed or intentional leaner, reflective professional, reflective judgment, etc.

Caution: Any one of the three definitions listed above denotes a very large and multifaceted construct. For example, reflection is made up of several components and can even be seen as a large process versus a type of thinking. Self-monitoring and self-correction each contain several smaller steps that each have levels of skill involved and assume a goodly portion of discipline-based knowledge to pull off. Therefore, measuring any of these sub-skills can quickly expand beyond practical limits. Unless the ultimate goal of grading is one of these three constructs, (for example, a measure of a student’s reflection) I recommend using a brief and limited operational definition for measuring these sub-skills.

Reflection

In nearly every discipline, reflection involves some sort of retrospection or self-evaluation of actions, biases, assumptions, beliefs, feelings, or, of recently completed events, products, or processes. These are often a part of a portfolio. In almost every use of the term, reflection involves looking back at symptoms or outcomes as opposed to making predictions. Depending on the discipline, reflection can be a broad construct that encompasses many of the terms listed in this document or can describe a prescribed mental process. In many academic disciplines, reflection is limited to a product – often written – in which students describe their reasoning, judgments, feelings, evaluations, etc. In a few disciplines reflection is defined even more narrowly as a search for truth or social justice. However, some believe truth seeking is an outcome or purpose for critical thinking.