

Table 1. Proposed Critical Thinking Framework from Liu et al. (2014)

Dimensions	Description and rationale	Foci of assessment
<b>Analytical dimensions</b> Evaluate evidence and its use	Evidence provided in support of a position can be evaluated apart from the position advanced.	<i>Evaluate evidence in larger context.</i> Consider the larger context, which may include general knowledge, additional background information provided, or additional evidence included within an argument.
	In the foci of assessment, the factual basis for the evidence may be related to, but may also be evaluated independently of, evaluations of sources and/or biases.	<i>Evaluate relevance and expertise of sources.</i> Consider the reliability of source (person, organization, document) of evidence included in an argument. In evaluating sources, students should be able to consider such factors as relevant expertise, access to information.  <i>Recognize possibilities of bias in evidence offered.</i> Consider potential biases in persons or other sources providing or organizing data, including potential motivations a source may have for providing truthful or misleading information.
Analyze and evaluate arguments	A piece of evidence, though well founded, may yet be used inappropriately, to draw a conclusion that it does not support, or represented as providing more support than is warranted.	<i>Evaluate relevance of evidence and how well it supports the conclusion stated or implied in the argument.</i>  Evaluate <i>overall</i> relevance of evidence for the conclusion.  Evaluate consistency of conclusions drawn or posited with evidence presented. Evaluate strength of evidence offered.
	It can be difficult to evaluate an argument without an adequate grasp of its structure: What is assumed (implicitly or explicitly)? How does the author intend the premises to lead to the conclusion? Are there intermediate argument steps? Knowing the	<i>Analyze argument structure.</i> Identify stated and unstated premises, conclusions, intermediate steps. Understand the language of argumentation, recognizing linguistic cues.

Dimensions	Description and rationale	Foci of assessment
	relationships among parts of an argument is helpful in finding its strong and weak points.	<i>Evaluate argument structure.</i> Distinguish valid from invalid arguments, including recognizing structural flaws that may be present in an invalid argument, such as <i>holes</i> in reasoning.
<b>Synthetic dimensions</b> Understand implications and consequences	The conclusion of an argument is not always explicitly stated. Furthermore, arguments and positions on issues can have consequences and implications that go beyond the original argument:  If we accept some particular principle, what follows? What might be some possible results (intended or otherwise) of a recommended course of action?	<i>Draw or recognize conclusions from evidence provided.</i> When a conclusion is not explicitly stated in an argument or collection of evidence, draw or recognize deductive and supported conclusions.  <i>Extrapolate implications.</i> Take the reasoning to the next step(s) to understand what further consequences are supported or deductively implied by an argument or collection of evidence.
Develop sound and valid arguments	This dimension recognizes that students should be able to not only understand and evaluate arguments made by others, but to develop their own arguments that are valid (based on good reasoning) and sound (valid and based on good evidence).	<i>Develop valid arguments.</i> Employ reasoning structures that properly link evidence with conclusions. <i>Develop sound arguments.</i> Select or provide appropriate evidence, as part of a valid argument.
<b>Relevant to analytical and synthetic dimensions</b>		
Understand causation and explanation	This dimension is applicable to and works with all of the analytical and synthetic dimensions, because it can involve considerations of evidence, implications and argument structure, as well as either evaluation or argument production. Causes or explanations feature prominently in a wide range of critical thinking contexts.	<i>Evaluate causal claims, including distinguishing causation from correlation, and considering possible alternative causes or explanations.</i>  <i>Generate or evaluate explanations.</i>