Rubric for analysis of student understanding of evidence-based explanations.
Examining dimensions of evidence-based explanations

Dimension	Level 1	Level 2	Level 3
1. Degree to which the student makes comparisons among pieces of evidence.	o Student uses only one form of evidence. o For example: discussion of data in a simple experiment, or discussion of an amino acid sequence in a textbook example.	o Student *reports* multiple forms of evidence. o For example: *reports* data from a complex controlled experiment, or *reports* about human, chimp, and gorilla amino acid sequences from a textbook example.	o Student *compares* multiple forms of evidence (data from one investigation or multiple investigations) in a sophisticated way or considers counterevidence. o For example: *compares* findings from complex experiment(s), or *compares* amino acids sequences from humans, chimps, and gorillas from a textbook example.
2. Degree of depth in student's explanation.	*Explanations with theoretical components:* o Student describes *what* happened. o Student describes, summarizes, or restates a pattern or trend in data without making a connection to any unobservable/ theoretical components.	o Student describes *how* or partially why something happened. o Student addresses unobservable/ theoretical components tangentially.	o Student explains *why* something happened. o Student can trace a full causal story for why a phenomenon occurred. o Student uses powerful science ideas that have unobservable/ theoretical components (such as kinetic molecular theory) to explain observable events.

	Explanations with mathematical components: o Student describes *what* happened. o Student describes, summarizes, or restates a pattern or trend in data.	o Student describes *how* something happened. o Student links observations to mathematical concepts in isolation. o For example: correlates the number of strings supporting a load in a pulley system with the effort to lift the load.	o Student explains *why* a mathematical model accounts for a phenomenon. o Student links observations to statistical or other mathematical models. o Student explains the links between observations and statistical or other mathematical expressions.
3. Degree to which evidence and explanations are integrated in written products.	o Student reports of data are sandwiched in between descriptions of what happened.	o Student begins to describe how data are about a larger idea. o Connections between evidence and explanations are implied but not fully described.	o Student writes about how observable/ measurable components are cases of unobservable/ theoretical ideas. o Students can identify how the specific component from the investigation(s) relates to the general case from theory or a complex mathematical relationship. o Student explanation contains a claim that justifies the link between observable data and unobservable/ theoretical components.