

Sufficiency of Evidence when Writing Scientific Arguments

The sufficiency of evidence construct map is appropriate to use when the scientific phenomenon can be explained by changes in more than one variable. Specifically, the levels within the construct map capture the number of variables the students use when they write an argument that are relevant to the science topic. At the lowest level of this construct map, the student does not use any of the relevant variables. At level 1 the students discuss some variables that are relevant to the science topic, but also include some variables that are irrelevant. This level is supported by research that suggests that students routinely use irrelevant evidence (Kuhn & Reiser, 2005; McNeill & Krajcik, 2007; Sandoval, 2003). At the highest level, students are able to critique the relevancy of the variables and only provide evidence that is relevant to the science topic.

Sufficiency of evidence construct map for the writing assessments

	Level	Description
<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 5px;">High</div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 100px; margin: 0 5px;"></div> <div style="text-align: center; margin-left: 5px;">Low</div> </div>	2	<p style="text-align: center;">All Evidence</p> <p>Student provides empirical evidence (observations or measurements that support the claim) for ALL the relevant variables provided that could be used to explain the multivariate phenomena in question.</p>
	1	<p style="text-align: center;">Some Evidence</p> <p>Student provides empirical evidence (observations or measurements that support the claim) for SOME of the relevant variables provided that could be used to explain the multivariate phenomena in question.</p>

References:

- Kuhn, L., & Reiser, B. (2005). Students constructing and defending evidence-based scientific explanations. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Dallas, TX.
- McNeill, K. L., & Krajcik, J. (2007). Middle school students' use of appropriate and inappropriate evidence in writing scientific explanations. In M. Lovett & P. Shah (Eds.), *Thinking with data: The proceedings of the 33rd Carnegie symposium on cognition*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Sandoval, W. A. (2003). Conceptual and epistemic aspects of students' scientific explanations. *Journal of the Learning Sciences*, 12, 5-51.