

Reasoning when Writing Scientific Arguments

In order for an argument to be persuasive and convincing, there must be a connection between the claim being made and the justification used to support that claim (Sampson & Clark, 2008). In practice, the reasoning in an argument “articulates the logic... [of] why the evidence supports the claim” (Berland & McNeil, 2010 p.772). We want students to explicitly provide reasoning for their arguments and award higher scores for arguments that are explicit in connecting their justifications to their claims. Specifically, in these assessment items we focus on students writing arguments for an explanation of a scientific phenomenon. Consequently, at the highest level students' reasoning needs to include an underlying theoretical cause or mechanism for a natural event (Braaten & Windschitl, 2011). Because reasoning connects the evidence to the claim, both a claim and evidence are necessary components for students to be able to provide reasoning. This implies that reasoning may be difficult for students who are still struggling to provide both claims and evidence.

Reasoning construct map for the writing assessment

	Level	Description
High	5	Link & Science Ideas & Persuasive Writing Student explicitly connects a stated claim to their justification of the claim. It must include a mechanistic or causal explanation (likely from the item), and the overall argument is persuasive/convincing.
	4	Link & Science Ideas Student explicitly connects a stated claim to their justification of the claim. It must include a mechanistic or causal explanation (likely from the item).
	3	Explicit Link Student explicitly connects a stated claim to their justification of the claim.
	2	Implies Link Student implies a connection between a stated claim and justification of the claim.
Low	1	Restates Claim Student provides a justification that simply restates the claim.

References

- Berland, L. K. & McNeill, K. L. (2010). A learning progression for scientific argumentation: Understanding student work and designing supportive instructional contexts. *Science Education*, 94(5), 765-793.
- Braaten, M. & Windschitl, M. (2011). Working towards a stronger conceptualization of scientific explanation for science education. *Science Education*, 95, 639-669.
- Sampson, V., & Clark, D. B. (2008). Assessment of the ways students generate arguments in science education: Current perspectives and recommendations for future directions. *Science Education*, 92(3), 447-472.