



### Discourse Tool #3: Pressing students for evidence-based explanations

**Purpose of tool?** This tool helps students co-construct evidence-based explanatory models for the natural phenomenon that has been the focus of the unit.

**When to use tool?** After you’ve allowed students to create some initial models of the key phenomenon, given them some data collection experiences, and exposed them to important written resources to aid their conceptual understanding (i.e. Discourse 2). This should happen at the end of a unit, but also at other times when you are trying to get students to talk about evidence.

#### Step 1. Re-orienting students to the focal models and hypotheses.

Come to class with a diagram of the initial models and students’ hypotheses. Review the initial model(s), hypotheses (may be more than one) and problem context.

*You ask:*

- “This is what our groups have been thinking about—what is it we have been trying to represent?”
- “What is the puzzle we are trying to solve?”
- “What are we trying to explain?”

*Then you need to listen for, plan to respond to:*

If students say, for example, “We are creating a model of a battery”, you need to re-name the model in terms of the underlying idea—in this case, of “energy flow”. If students say “We are creating a model of a candle in water.” YOU say “We’re working toward a model of “air pressure”. NOT of snails and plants in a jar, but of “nutrient flow” or “gas exchange.”



#### Step 2. Coordinating a tentative explanation with available evidence.

Here you are giving “air time” to competing explanations. Students may offer pseudo-explanations that you need to “push back on.” Sometimes this is the point at which kids need “just in time” instruction from you.

*You ask:*

- “What do we think is causing \_\_\_?”
- “Who would like to offer an explanation?”

*What you need to listen for, plan to respond to:*

What if students start talking about descriptive findings only, or talk only about how things are correlated: “When we did this, then this variable increased”?

What if students depend only on vocabulary in their explanations? Example: *Why do male pheasants have dull coloration? Because of evolution.*

What if students respond to an imagined question? Example: *Why does it rain? Because plants need water to survive.*

What if students skip over the chain of events? Example: *Why does water boil? Because you heated it.*



#### Step 3. Committing an explanation to paper

*You say:*

- “Now stop and write down your explanation” (groups or individually). Remember your explanation should include these ideas: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.”

*Following this, you should say:*

- “Now from the data you collected in the \_\_\_ activity, or from ideas you read about in the text, you need to come up with two pieces of evidence that supports your explanation.”

#### [NEXT DAY] Step 4. Talking about the strength of the data and the reasoning

Ask kids to share explanations with a neighbor. As they do this, circulate and listen to each group. You then decide one or two explanations to feature. One of these should be reasonable and coherent. Use a graphic organizer to let *students* talk about how evidence supports or contradicts explanations.

#### Step 5. Writing a final explanation

*You say:*

- “Now re-write your final explanation.” “Compare your explanation now with your previous explanation--what made you change your explanation of why this phenomena happened the way it did?” “Should we go back and change our models?” “Remember your explanation should include these ideas: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.”

#### Step 6. Applying the new explanatory model

*You say:* “Now that we have a good evidence-based model, what other kinds of phenomena would our model help us explain or predict?” “Are there situations in which our model would not work? Why not?”

**Assumptions** about your background understandings before using this quick guide; if you need help with these, look in the full tool.

1. You understand that this discourse takes two or three class periods.
2. You have drawn out the RICHEST, most detailed causal explanations your students could possibly give.
3. You understand what an explanatory model is.
4. You understand “what counts” as supporting evidence that your students can access from class activities and readings.
5. You understand what “just-in-time” instruction is.

## Designing your specific questions for each step of the tool

<i>Generic questions for each step</i>	<i>Actual questions or support you'll offer</i>	<i>What to listen for and plan to respond to</i>
<p><b>Step 1. Re-orienting students to the focal models and hypotheses.</b></p> <ul style="list-style-type: none"> <li>• “This is what our groups have been thinking about—what is it we have been trying to represent?”</li> <li>• “What is the puzzle we are trying to solve?”</li> <li>• “What are we trying to explain?”</li> </ul>		<p><i>Then you need to listen for, plan to respond to:</i></p> <p>What if students can only talk about their explanations in terms of specific observables and not in terms of an underlying model? (see examples on previous page).</p>
<p><b>Step 2. Coordinating a tentative explanation with available evidence.</b></p> <ul style="list-style-type: none"> <li>• “What do we think is causing ___?”</li> <li>• “Who would like to offer an explanation?”</li> </ul>		<p><i>What you need to listen for, plan to respond to:</i></p> <p>What if students start talking about descriptive findings only, or talk only about how things are correlated?</p> <p>What if students depend only on vocabulary in their explanations?</p> <p>What if students respond to an imagined question?</p> <p>What if students skip over the chain of events?</p>
<p><b>Step 3. Committing an explanation to paper</b></p> <ul style="list-style-type: none"> <li>• “Now stop and write down your explanation” (groups or individually).</li> </ul> <p><b>Followed by:</b></p> <ul style="list-style-type: none"> <li>• “Now from the data you collected in the ___ activity, or from ideas you read about in the text, you need to come up with two pieces of evidence that supports your explanation.”</li> </ul>		<p><i>What you need to listen for, plan to respond to:</i></p> <p>What if students cannot begin to write an explanation, how will you help them begin?</p> <p>What if students cannot imagine what a piece of evidence might be? How will you help them not just state of piece of evidence, but understand what counts as evidence?</p>
<p><b>Step 4. Talking about the strength of the data and the reasoning</b></p>		<p><i>What you need to listen for, plan to respond to:</i></p> <p>What will you do if students cannot make connections between evidence and explanations? Or if they don't see how evidence might contradict an explanation?</p>
<p><b>Step 5. Writing a final explanation</b></p>		<p><i>What you need to listen for, plan to respond to:</i></p> <p>How can you help students understand what might have to be changed in their previous model?</p>
<p><b>Step 6. Applying the new explanatory model</b></p>		<p><i>What you need to listen for, plan to respond to:</i></p> <p>How might you help students who cannot understand how to apply their explanatory model to another kind of situation or phenomenon?</p>