Discourse Kit

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Evidence & Reasoning Sentence Starters

Use these in Socratic Seminar, think-pair-share, and group inquiry activities. The goal is not fancy wording—it's clear scientific thinking.

Claim (what you think is true)

"A conservative interpretation is that…"

"The figure suggests that…"

"My current best claim is…"

Evidence (what you're pointing to)

"I'm basing that on _____ (axis/line/value/quote)…"

"In the region where _____, the trend shows…"

"The key detail is _____, which indicates…"

Reasoning (why the evidence supports the claim)

"That supports the claim because…"

"If _____ increases, then _____ should change because…"

"The physical story is: _____ $\rightarrow$ _____ $\rightarrow$ _____."

Assumptions (what must be true)

"This depends on the assumption that…"

"We're implicitly assuming _____ (calibration / geometry / equilibrium / negligible dust)…"

"If that assumption fails, the conclusion could change by…"

Alternative explanations (how to avoid tunnel vision)

"Another explanation consistent with the data is…"

"A competing model would predict…"

"These interpretations differ mainly in the assumption that…"

Uncertainty (allowed; vagueness is not)

"I'm about ___% confident because…"

"The biggest uncertainty is…"

"I'm unsure whether _____ or _____, because the data don't constrain…"

Discriminating tests (what would we measure next?)

"A measurement that would distinguish these is…"

"If we observe *, it would support model A; if we observe* , it would support model B."

"The next-best observation would be _____ because it reduces the degeneracy between…"

Building on others (collaboration moves)

"I want to build on what _____ said by adding…"

"I agree with _____ under the condition that…"

"I interpret that differently because the evidence suggests…"

Common Astronomy Inference Pitfalls

Astronomy is inference under constraints. These pitfalls are *normal*—the goal is to notice them early and build guardrails.

Use this sheet during problem-solving and seminar.

1. Mixing up what's measured vs what's inferred
   Guardrail: Write "Observable:" and "Inference:" separately.
   Example: flux is measured; distance is inferred using a model.

2. Confusing brightness with luminosity
   Brightness (flux) depends on distance.
   Luminosity is intrinsic power output.
   Guardrail: Ask: "Is this property distance-dependent?"

3. Treating a model assumption as a fact
   Examples: circular orbits, equilibrium, "standard candle," negligible dust.
   Guardrail: Say: "This conclusion holds if _____."

4. Over-claiming (data show X → therefore theory Y is true)
   Data usually constrain a family of models.
   Guardrail: Ask: "What else could explain this pattern?"

5. Ignoring selection effects ("what got into the dataset?")
   What you observe is shaped by detection limits and survey design.
   Guardrail: Ask: "What might be missing, and why?"

6. Forgetting units or axis scaling (especially log axes)
   A straight line on a log plot means something different than on a linear plot.
   Guardrail: Always write the units and identify linear vs log.

7. Confusing correlation with causation
   Two quantities can vary together due to a third variable or measurement bias.
   Guardrail: Ask: "What mechanism connects them? What would break the trend?"

8. Treating uncertainty as a footnote
   Uncertainty is part of the claim.
   Guardrail: Try: "I'm ~___% confident because..." and name your biggest uncertainty.

9. Single-figure tunnel vision
   A great plot can still be misleading without context (calibration, sample, method).
   Guardrail: Ask: "What information is missing that could change interpretation?"

> 💡 The most scientific question you can ask
>
> **"What observation would discriminate between these explanations?"**