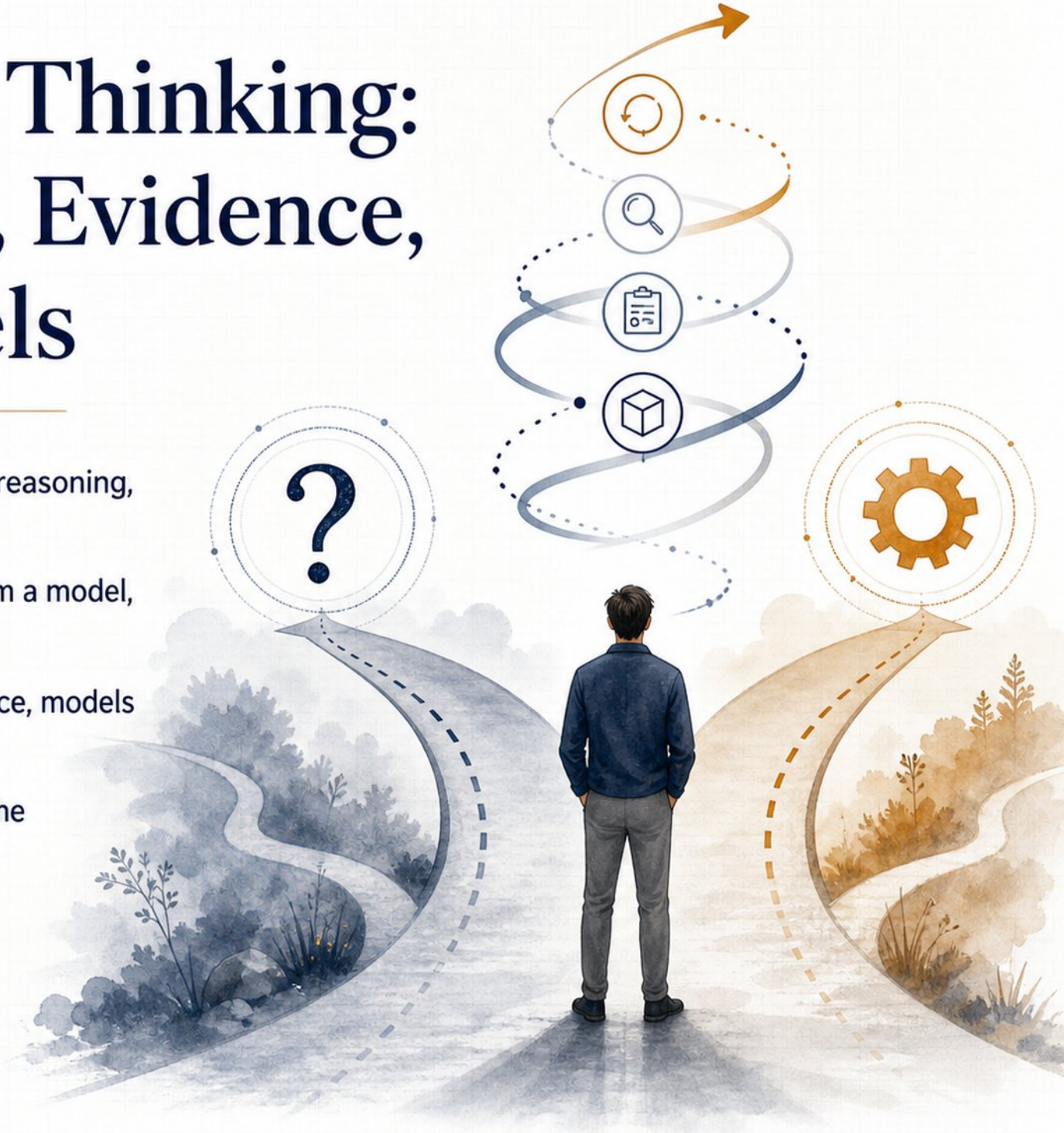
Scientific Thinking: Questions, Evidence, and Models

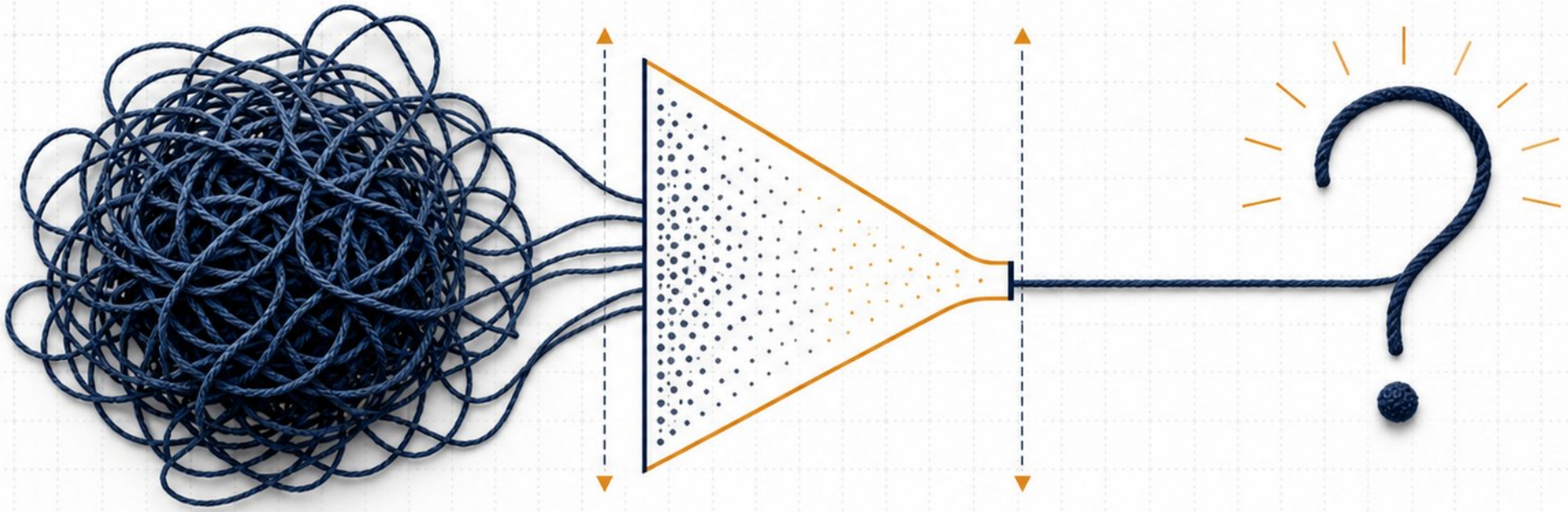
- - A learnable skill for everyday reasoning, not just a lab process
- - Core loop: ask a question, form a model, gather evidence, update
- - Three parts: questions, evidence, models with practical examples
- - A relatable scenario showing the loop in action



Defining Scientific Thinking as a Life Skill

- A systematic way to explore, explain, and update your understanding of the world
- Reduces error, improves decisions, and communicates your reasoning clearly
- Shift from needing to be right to wanting to be less wrong over time
- Course flow: Questions, Models, Evidence, Traps, and Personal Application

What Makes a Question Scientific



- “Testable, specific, and value-neutral framing”
- “Turns vague worries into concrete investigations”
- “Avoids broad, vague, or assumption-loaded questions”
- “Some questions sound scientific but aren’t testable”

From Implicit Intuition to Explicit Models

A model is a simplified representation of how something works

Implicit models live in your head; explicit models are shareable

Externalizing your model reveals errors and invites useful critique

Test an assumption: “My coworker is unmotivated” becomes a testable model

Three Simple Model Types for Daily Use

Causal

- **Causal:** If X changes, what happens to Y? (e.g., more sleep → better focus).

Analogy

- **Analogy:** This works like something I already understand (e.g., cash flow ≈ household budget).

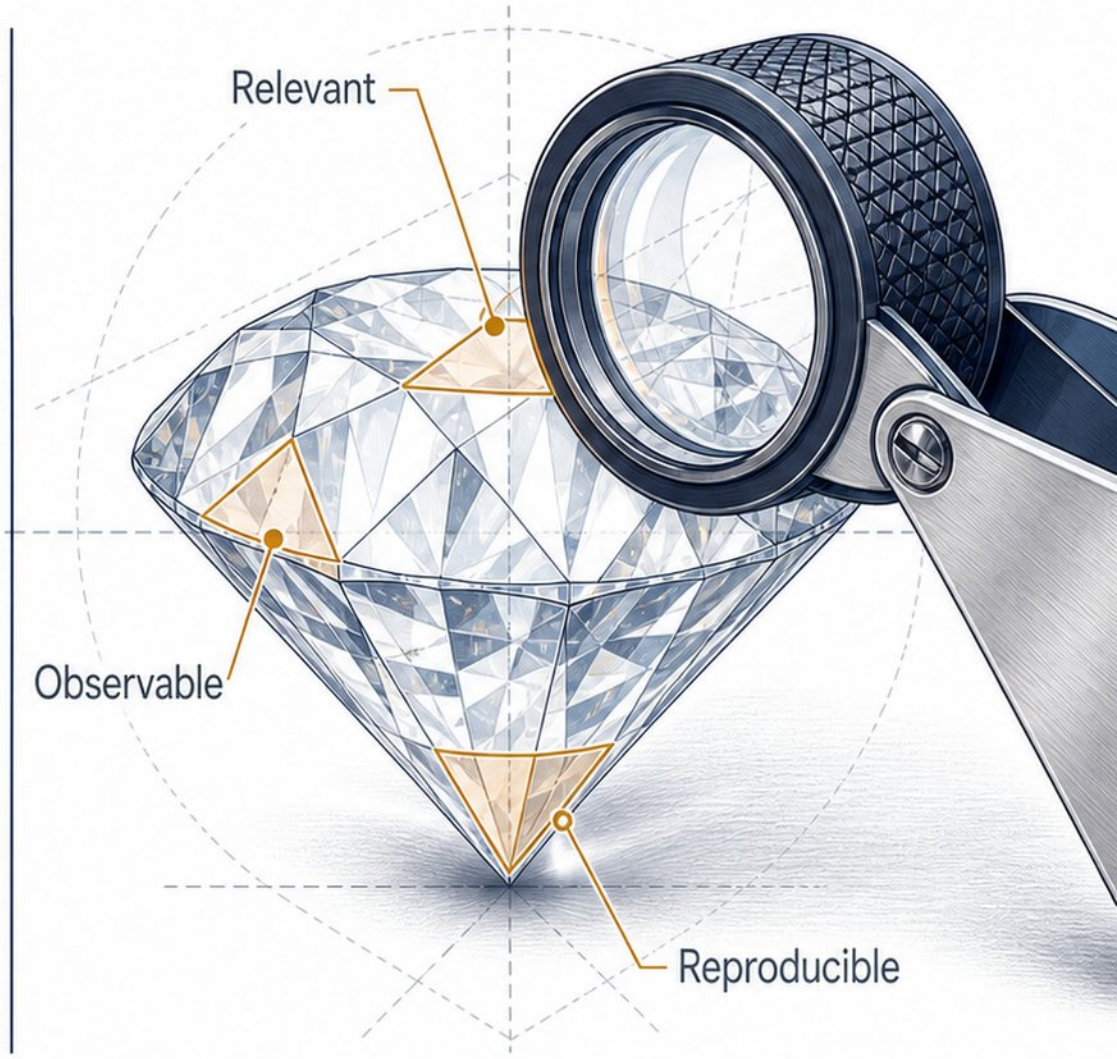
Rule-of-thumb

- Rule-of-thumb: Heuristics that work until they break (e.g., 'buy cheap, buy twice').

- Choose based on your question type and available information

Evidence: What Counts and Why

- Information that increases or decreases confidence in a model
- Relevant, observable, reproducible, and not cherry-picked
- Distinct from opinion, anecdote, or appeal to authority
- Strong evidence is systematic; weak evidence is selective or vague

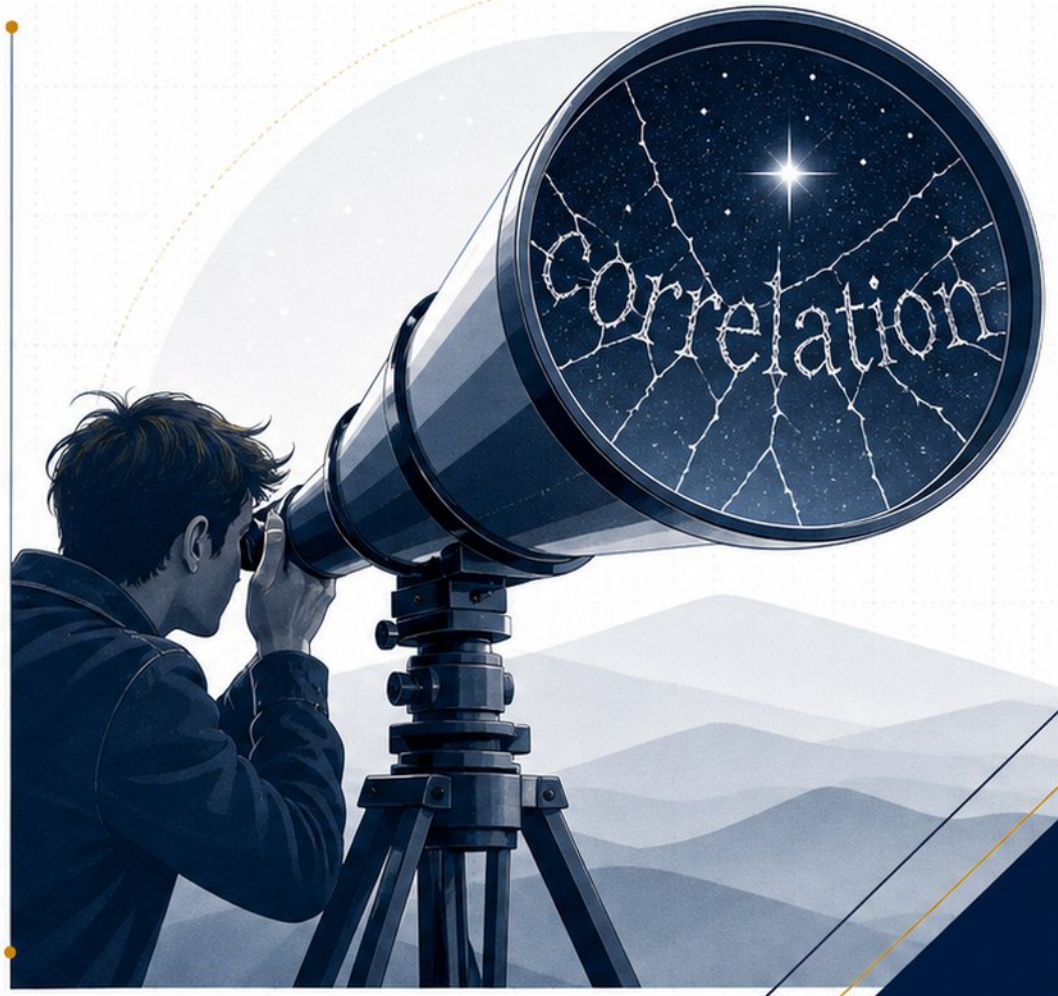


Gathering Evidence in Everyday Life

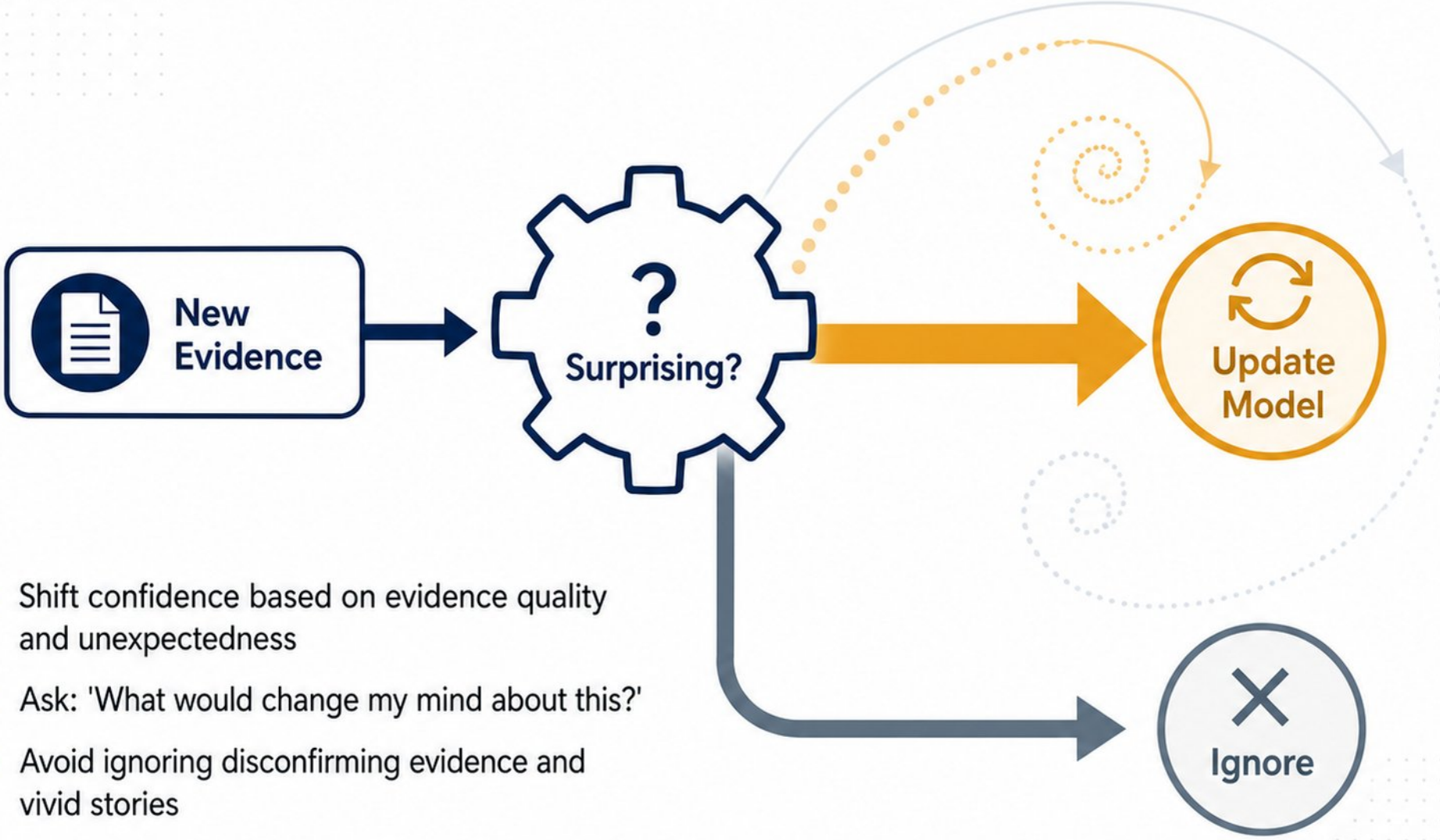
- Before/after and side-by-side comparisons to spot change
- Track habits over time with simple logs
- Use personal records, public data, or credible reports
- Run low-cost A/B tests: morning routine, recipe tweak
- When to observe rather than experiment

Interpreting Evidence Without Overconfidence

- Distinguish signal from noise, especially with small sample sizes
- A single data point is rarely conclusive; context matters
- Don't mistake correlation for direct causation
- Always ask: 'What else could explain this observation?'



Updating Your Model When Evidence Surprises You

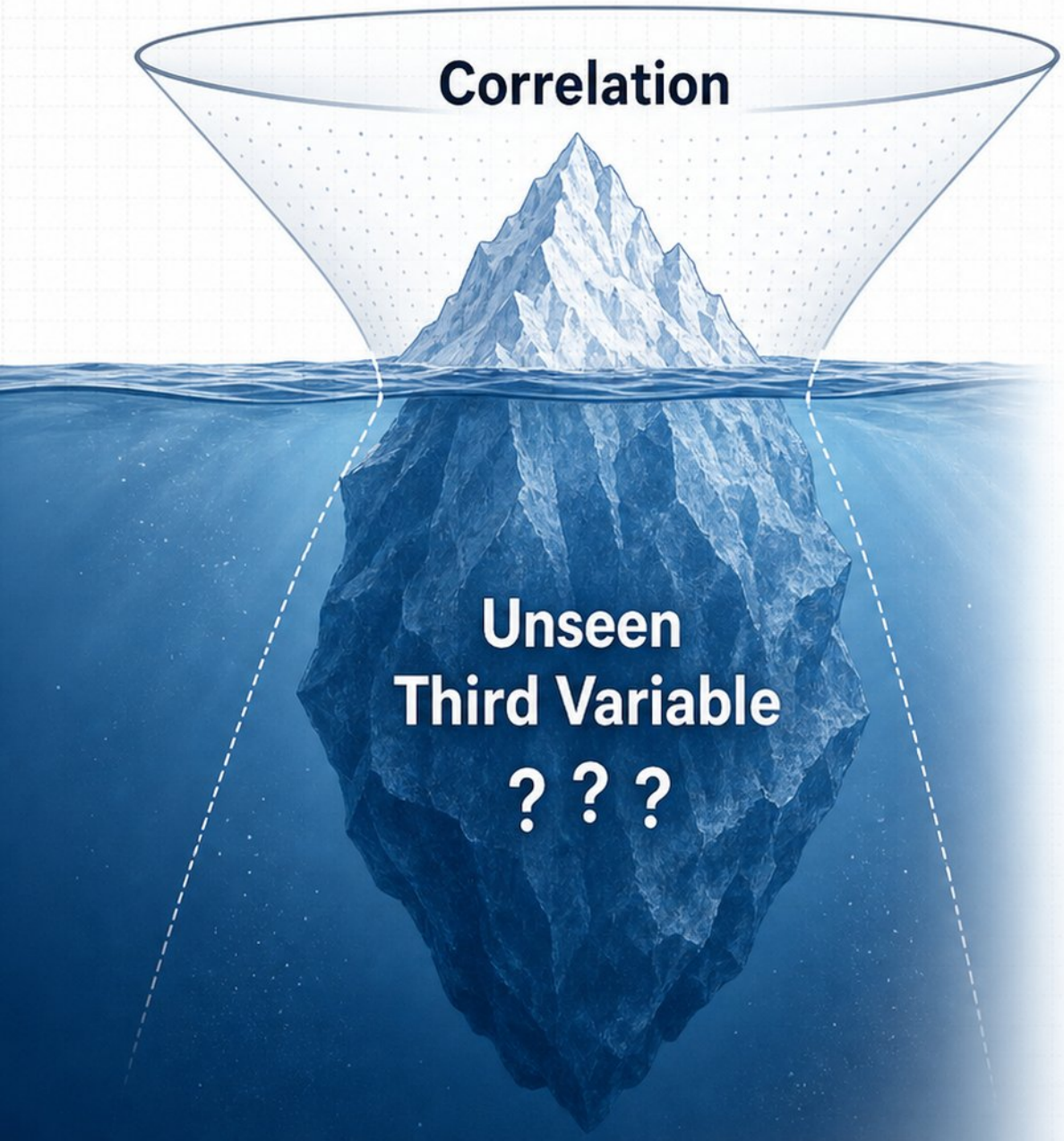


- Shift confidence based on evidence quality and unexpectedness
- Ask: 'What would change my mind about this?'
- Avoid ignoring disconfirming evidence and vivid stories
- Stop defending your model; update it instead

Spotting Confirmation Bias and Its Cousins

- **Confirmation bias:** seeking evidence that supports your existing model
- **Survivorship bias:** seeing only winners and ignoring the failures
- **Availability heuristic:** overestimating likelihood of events easy to recall
- **Counter-strategies:** play devil's advocate, seek missing cases, track base rates

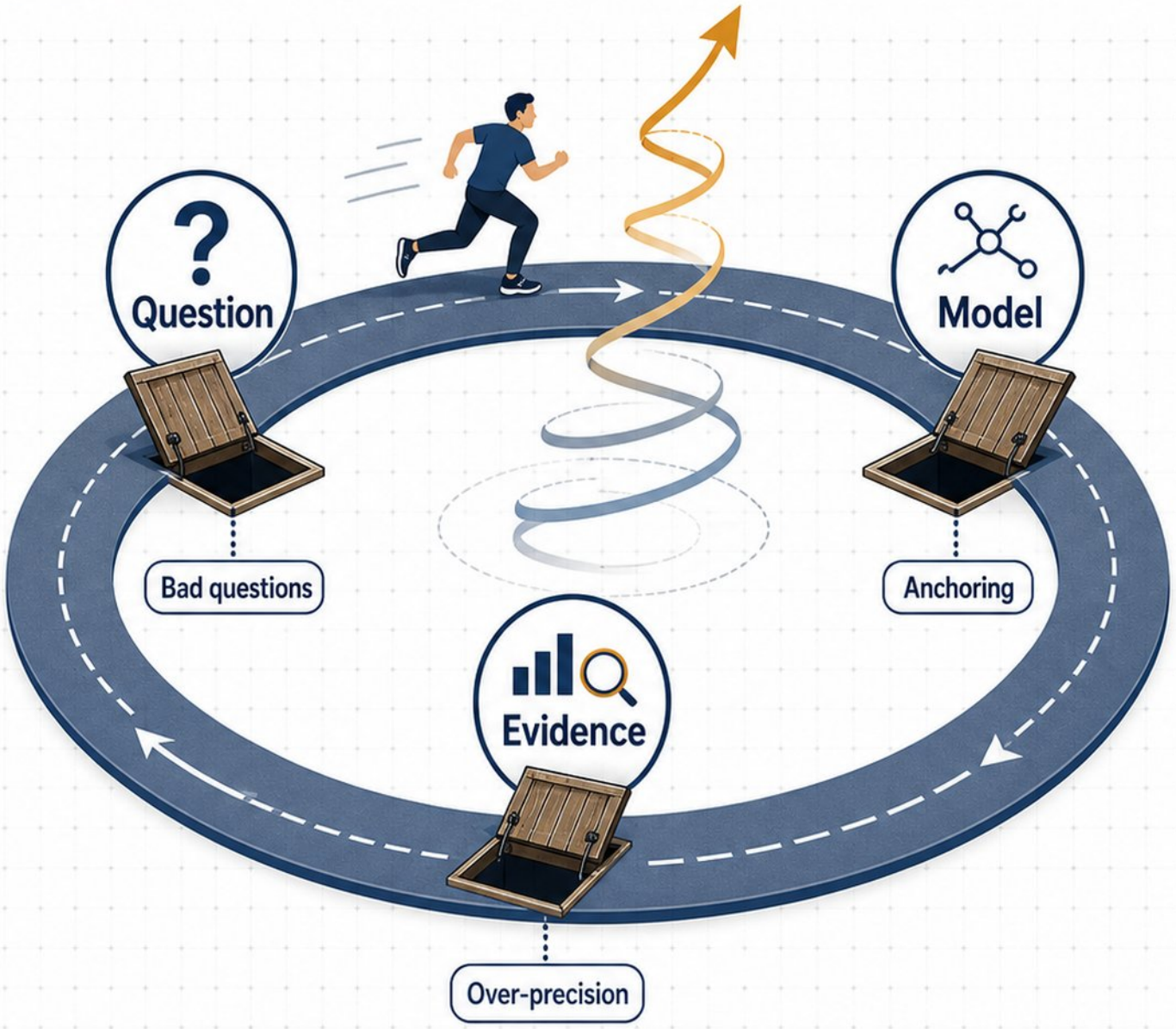
Correlation and Causation: Untangling the Trap



- **Brain wiring:** we instinctively see cause-effect patterns, even when absent
- **Third-variable trap:** a hidden factor often drives both observed variables
- **Practical checks:** temporal order, plausible mechanism, and dose-response
- **Example:** "runners are healthier" doesn't prove running causes health

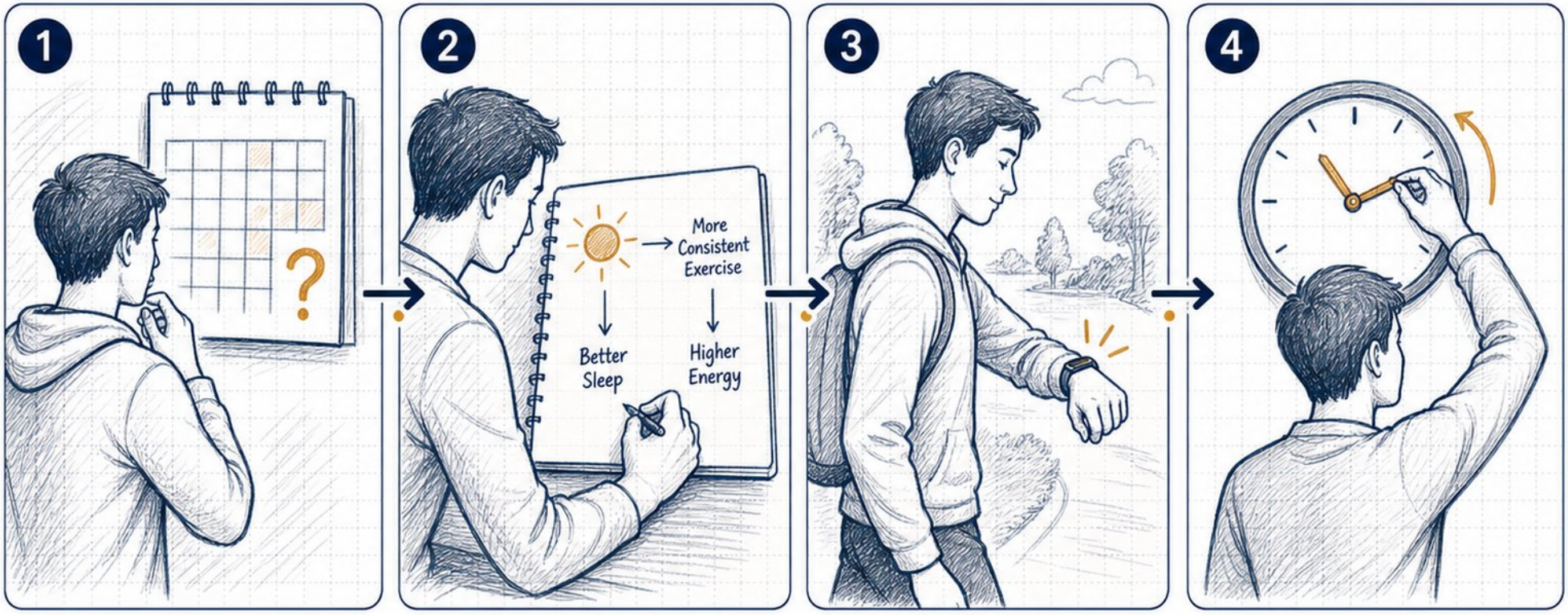
Reasoning Traps in the Question–Model–Evidence Loop

- Bad questions lead to flawed models and cherry-picked evidence
- Anchoring: first impressions skew your entire model
- Over-precision: believing your model is more accurate than evidence supports
- Self-audit checklist for each stage of the loop



Walkthrough: Deciding Whether to Change a Daily Routine

- **Scenario:** switching from evening to morning exercise
- **Step 1:** Ask a testable question about energy and adherence
- **Step 2:** Build a causal model predicting better sleep and consistency
- **Step 3:** Gather two-week tracking log on energy, sleep, and completion
- **Step 4:** Update model partially—adherence improved, sleep did not



Documenting and Sharing Your Reasoning

- Structure a reasoning record: question, model, evidence, update, next action
- Sharing surfaces blind spots and improves team decisions
- Frame uncertainty with 'my current estimate' or 'based on the evidence so far'
- Example: share a decision record for a purchase or new habit

Building Your Scientific Thinking Habit

1. Ask a testable question.
2. Make your model explicit.

3. Gather relevant evidence.
4. Update your confidence.

Practice in low-stakes: choosing a restaurant, predicting a commute.

The 'one question a day' challenge: turn an assumption into a question.

Resources and next steps for continued learning.

DAILY QUESTION

MODEL VERSION

Key Takeaways and Your Next Steps

- Scientific thinking: testable questions, explicit models, quality evidence

- Core habit: update confidence, don't defend your model

- Watch for: confirmation bias, survivorship bias, correlation traps

- This week: apply the loop to one real decision

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