



Crosscutting Concept: *Patterns*

Patterns*

“Patterns exist everywhere—in regularly occurring shapes or structures and in repeating events and relationships. For example, patterns are discernible in the symmetry of flowers and snowflakes, the cycling of the seasons, and the repeated base pairs of DNA. Noticing patterns is often a first step to organizing and asking scientific questions about why and how the patterns occur.”

“Once patterns and variations have been noted, they lead to questions; scientists seek explanations for observed patterns and for the similarity and diversity within them. Engineers often look for and analyze patterns, too.”

Source: *A Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas*; National Academy Press 2012

* Patterns: one of seven Crosscutting Concepts “that bridge disciplinary boundaries ... fundamental to an understanding of science and engineering.” Source: *Ibid.*

For more Crosscutting Concept Correlations, visit:
thepriateeye.com

THE PRIVATE EYE Connection:

The Private Eye Questioning Strategy, Loupe, and everyday objects

build habits of mind: *Looking Closely, Thinking by Analogy, Changing scale, and Theorizing* as learners write, draw, and theorize about the natural and manmade world.

- **boosts pattern awareness, pattern hunting, and pattern recognition** — The loupe-view close-up and wow! + the first TPE Question together make patterns pop, break stereotypes, and prompt a hunt for similarities / differences.
- **prompts curiosity, wonder, questions about patterns**
The loupe-view close-up and wow! instantly arouses wonder and curiosity about patterns. The Private Eye Questions make it personal and drive it home, beginning with: “What else (including what other patterns) does this remind me of? What else? What else? What else?” and “Why is it like that?” “Why does this pattern exist?”
- **provides clues to why a given pattern exists in nature**
— based on the form/function relationship in nature (built-in to The Private Eye questioning strategy)
- **enables students to generate hypotheses about patterns**
Using The Private Eye’s 4-question sequence, students generate clues to why something is the way it is and turn their “clues” into hypotheses. (Clues are in the form of compressed analogies: i.e., metaphors / similes.)
- **builds sensitivity to patterns at different scales** — Using loupes *and* TPE Questions learners “Loupe-leap to the microscopic”. Changing scale from the natural eye to 5X to 10X, students move easily to an interest in patterns across scale changes — from tiny to vast.
- **drives pattern “change of scale” thinking** — The Private Eye’s 1st Question drives observing and thinking across changes of scale. E.g.: Note the change-of-scale thinking in this student’s loupe-analogy observations of a whole walnut in a shell: *The walnut’s convolutions remind me of those in a human brain. The shell’s hardness reminds me of a skull, or a football helmet, or the shell of a car.*



The Private Eye — (5x) Looking / Thinking by Analogy: A Guide

to Developing the Interdisciplinary Mind; Kerry Ruef (The Private Eye Project).

For a quick introduction to The Private Eye process and fundamental lessons, see: *Part II: Process and Tools*, (especially pp. 16-17, 22-30); *Part III: The Interdisciplinary Mind Close-up*, (esp pp. 38-42, 51-59); and *Part V: Curriculum Tour*, (especially pp. 84-92). Then visit more lesson plans and ideas in each of the curriculum area “tours”.