



Common Core State Standards for Mathematics: Mathematical Practices K-12
THE PRIVATE EYE® — (5X) LOOKING / THINKING BY ANALOGY® Correlation



Mathematical Practices K-12

The Private Eye® aligned with Common Core State Standards



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Welcome!

The Private Eye makes math a language to love, even as it helps build a mathematical vocabulary. It turns math into something personal, intriguing, friendly, alive. The Private Eye's hands-on, interdisciplinary process and instructional strategy braids together three languages: verbal, visual, and mathematical.

The Private Eye begins with four simple questions, everyday objects, and a jeweler's loupe (an almost magical magnification tool). Using The Private Eye process students enhance concentration, heighten their awareness of pattern and detail, and learn to evoke analogic thinking for problem-solving. TPE delivers students directly to the "land of Math" — the science of patterns and relationships. Whenever you use The Private Eye, pattern is "in your face"—you're massaging the math brain, even as you massage the scientist's, writer's, artist's brain.

The Private Eye blends with your existing math course-of-study to develop habits of mind essential to mathematical practice. As you consider your math year, you'll find you can use TPE in your classroom to: introduce, enhance, cement and assess mathematical concepts and content. It helps students settle down and focus as preparation for a new or existing mathematical concept. It calms their fears that a math topic will be too difficult, too foreign. It grounds concepts in a student's personal knowledge and associations and in the five senses. It generates mathematical inquiries that live and breathe.

With its simple tools, rich questioning strategy, and everyday objects, students can write, draw, theorize, count, measure, compute, calculate, estimate, predict and perform mathematical operations. In the process they build four underlying *and interwoven habits of mind* critical to academic success: looking closely, thinking by analogy, changing scale, and theorizing. These are the intellectual "tools" not only for mathematical literacy, but for creativity, literacy, and scientific literacy as well. The book, *The Private Eye —(5X) Looking/Thinking by Analogy: A Guide to Developing the Interdisciplinary Mind*, shows how to fluently develop these essential habits. A special Math Tour of lesson connections begins on page 173.

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This document correlates *The Private Eye—(5X) Looking/Thinking by Analogy* to the mathematical practices outlined in the Common Core State Standards for Grades K-12. (For Private Eye CCSS Literacy correlations, please see our separate publication.)



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Standards for Mathematical Practice

THE PRIVATE EYE® — (5X) LOOKING / THINKING BY ANALOGY®

A Guide to Developing the Interdisciplinary Mind

Meet all eight CCSS Standards for Mathematical Practice using The Private Eye (TPE) in Math *and* across your curriculum day, K-12:

1. Make sense of problems and persevere in solving them. Thinking by Analogy (making associations and using them for theorizing, inferring, modeling) is how we make sense of the world. The Private Eye boosts analogic reasoning as it also builds concentration, ever-increasing attention to detail, and wonder at the world's patterns and relationships. Using TPE builds perseverance incrementally and naturally. The Private Eye's exploratory inquiry generates options to approach problem solving. It builds *problem-solving by analogy* using verbal, visual, and mathematical languages.

2. Reason abstractly and quantitatively. Analogic reasoning is the abstract reasoning at the heart of mathematical reasoning. TPE process is rooted in analogic reasoning: proportional reasoning, making inferences, theorizing — based on strategic use of associations. (BTW, the term “analogy” was originally a math term!)

“Analogy is the Interstate Freeway of Cognition”, notes Douglas Hofstadter. We use analogy in forms verbal, visual, and numerical — creating and using analogs, comparisons, and models — to understand and solve problems. TPE tools and strategy evoke and constantly build analogic / comparative thinking for students and adults. Hands-on explorations quicken abstract reasoning while keeping students grounded in real world applications. Repetition with TPE process makes analogic reasoning in verbal, visual and mathematical languages into a habit for students, an instinctive practice.

3. Construct viable arguments and critique the reasoning of others. TPE's inquiry approach includes: “Why is it like that?” “What's going on here?” TPE gives students a hypothesizing and theorizing strategy to answer these questions using words, numbers, images to generate models. Students work individually and collaboratively, examining and critiquing each other's methods and conclusions.

4. Model with mathematics. Models are essentially analogies: an exploration and a representation of patterns, structures, behaviors, and relationships we discover in the world around us. Numbers are analogs that explore and represent specific quantities, interactions, operations, measurements, behaviors, and relationships. TPE helps students practice moving between modeling with mathematical analogs and modeling with verbal, visual, and structural analogs.

5. Use appropriate tools strategically. The Private Eye Tools: a 5X Loupe (a marvelous magnification tool), everyday objects (manipulatives), loupe-drawing, and loupe-analogy observations are all mathematical tools in the context of math explorations. (TPE Questions are tools, as well!) The loupe allows students to change scale — to find mathematical numbers, shapes, concepts and relationships in small places in comparison with large scale situations. The loupe enlarges objects or parts of objects by 5X (10X if two loupes nested) creating a heightened interest in structures, patterns and measurements. It boosts Mathematical Practices #6, 7, and 8.

6. Attend to precision. The Private Eye's loupe and questioning strategy gives students a jolt of attention to detail: it literally “teaches” what attention to detail and precision *means*. Using TPE students explore real world shapes, structures and relationships in conjunction with analogic observations — verbal, visual, mathematical — to express ever more precise communication / thinking. TPE hones ability to discern and distinguish less obvious similarities and differences.

7. Look for and make use of structure. TPE loupes and Questions help students habitually look closely for structures, patterns and relationships at changes of scale, small and large. In a math context, this habit of mind translates into a heightened sensitivity to numerical structures and sequences.

8. Look for and express regularity in repeated reasoning. Thinking by Analogy fueled with Looking Closely is fundamental to pattern recognition. Using TPE in math — a repeating loop of questions for investigating and reasoning — sensitizes students to looking for regularity in mathematical structures.

✦ When you use The Private Eye's interdisciplinary process in math, you not only meet math standards correlated to the lesson, but specific Science and Literacy Standards as well. See CCSS Literacy / TPE correlations.