Research Basis of

THE PRIVATE EYE®

(5X) LOOKING / THINKING BY ANALOGY

hands-on thinking skills, creativity, literacy & scientific literacy

A Few Eminent Reviewers
of The Private Eye Process:

✦ "So much of the wonder of our world goes unseen and unnoticed. With The Private Eye, the world becomes ever more fascinating... That alone would be enough—but your text goes far beyond—[leading us] to analyze, observe again, make analogies and transference."
> —Arthur L. Costa (an eminent thinking skills researcher)
>   Professor Emeritus, California State University, Sacramento;
>   Former President, Association of Supervision and Curriculum Development

✦ "I'm very impressed. A really exciting set of tools... to bring out the gifted in everyone."
> —Joseph Renzulli, Professor, Department of Educational Psychology,
>   University of Connecticut;
>   Director of The National Research Center on the Gifted and Talented

✦ "...an exceptionally ingenious and effective program for science teaching. I am very conscious of the importance of thoughtful, lively innovations that substantially raise the students' interest and thus raise the educational results. The Private Eye Project is the most promising such innovation I have ever seen."
> —Charles L. Remington, Professor of Biology and Environmental Studies,
>   Yale University; Curator, Yale Natural History Museum

✦ "The Private Eye is a wonderful contribution to literacy, poetry and ecological awareness."
> —Robert Hass, Former U.S. Poet Laureate and National Book Award winner
>   Professor, University of California at Berkeley

✦ "An exciting approach to engaging students in the art of scientific and mathematical thinking. It should be a part of every school program."
> —George "Pinky" Nelson, Former astronaut and Former Director, Project 2061

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The Private Eye®

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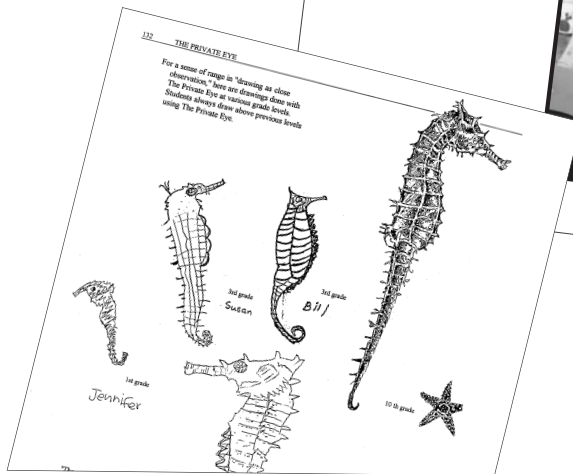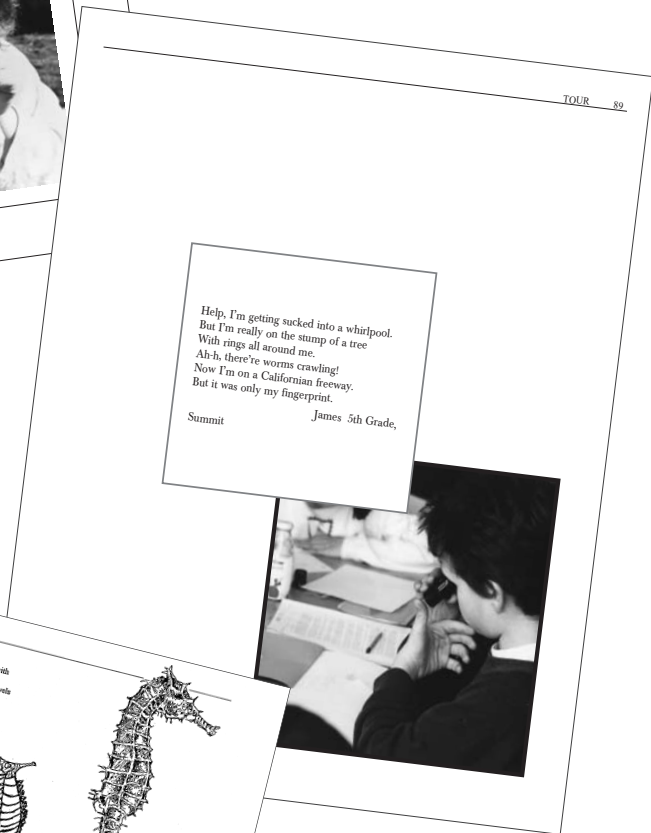
Introduction: What is The Private Eye?
What does it do for students and teachers - and how?

The Private Eye is a nationally acclaimed program for students K-16, through life. An instructional strategy, a process, a set of hands-on materials, and teacher training, The Private Eye develops higher order thinking skills, creativity, literacy and scientific literacy—across subjects. It is detailed in the book: *The Private Eye— (5X) Looking/ thinking by Analogy*, Ruef, 2003, 1998, 1993. The program is rooted in a highly motivating, hands-on, student-centered inquiry strategy using The Private Eye's simple but powerful questions, the marvelous jeweler's loupe and everyday objects. The goal of using The Private Eye systematically across the curriculum is to:

> 1) develop the habits of mind essential for success in all subjects: a sense of curiosity and wonder paired with a habit of looking closely; thinking (inferring) by analogy; the ability to change scale in one's thinking; and using these for hypothesizing / theorizing, inventing and problem solving in all subjects; 2) develop motivational bridges to content areas; 3) make recall of content easier; 4) make investigation into content areas simpler but sophisticated and scholarly; 5) develop students (and teachers) who naturally write-across-the-curriculum with high-level results.

The jeweler's loupe, also called an eye loupe, is a magnification tool. It's designed to cut out all peripheral vision as it magnifies a subject linked to the curriculum (flowers, insects, rocks, coins, etc.). The role of the loupe is to heighten concentration, reveal to students what it means to look closely (to pay attention), heighten a sense of wonder by revealing details in the subject the viewer could not otherwise see, and break stereotypes and cliches so that real thinking and discovery can instantly begin.

By answering the first Private Eye question while loupe-studying an object and writing the answers down ("What else does it remind me of? What else does it look like? What else? What else? What else?") the student accomplishes four things: 1) he/she continues to look and look again while exploring the subject, seeing *with meaning* what was not seen before, which breaks stereotypes and cliches; 2) the student becomes intrigued by the subject because he/she has connected it to his/her own experiences; 3) the student has instant "bones" for writing (Writing-

10   THE PRIVATE EYE

TOUR   89

Help, I'm getting sucked into a whirlpool.
But I'm really on the stump of a tree
With rings all around me.
Ah-h, there're worms crawling!
Now I'm on a Californian freeway.
But it was only my fingerprint.

Summit   James   5th Grade,

132   THE PRIVATE EYE

For a sense of range in "drawing as close
observation," here are drawings done with
The Private Eye at various grade levels.
Students always draw above previous levels
using The Private Eye.

3rd grade
Susan

3rd grade
Bill

1st grade
Jennifer

10 th grade

across-the curriculum becomes naturalized); and 4) the student simultaneously learns how to efficiently use his/her previous expe-rience to understand new sub-jects by making analogies and drawing inferences from those analogies ("If it reminds me of that, I wonder if it might function or work like that in some way?"). The student uses the analogies (in the form of metaphors and similes) to infer form and function, design and purpose of the object, or to solve a problem: his/her analogies are clues and hypotheses all-in-one. To put it another way: using their personally-generated analogies, students investigate similarities between some-thing new and something they are already familiar with— to solve problems and draw inferences about the subject at hand. Connections, patterns are built-into each analogy and into sets of analogies. With The Private Eye students practice and become natural at employing the scientific method, the writer's method, the artist's method, the mathematician's method, and the social scientist's method — all at once.

   Because there is *no wrong answer* to The Private Eye questions, students and adults bloom linguistically and conceptually. As students move through the Private Eye's simple steps, they use their initial loupe-analogy lists as the "bones" for writing short and long pieces of increasing complexity and great charm in all genres—writing that exhibits the important traits of "voice," "ideas," "specificity of detail" and "internal organization." Students loupe-draw their subjects to increase their sense of detail and specificity. They practice hypothesizing / theorizing based on their deceptively simple analogy lists and design and carry out tests of their "guesses." The Private Eye can be linked to almost any area of the curriculum as it builds the most useful habits of mind for success in school and life. With repetition, students learn to generalize The Private Eye approach (heightened observational skills, generating analogies and inferring by analogy) to all subjects (transfer-ence) and build life-long *habits of mind* for success in all fields.

Achievement: With The Private Eye approach, teachers and students easily **integrate the curriculum** in an everyday way and **accelerate interest and results** in virtually all curriculum areas. **Professional Development:** Teachers trained in and using The Private Eye are using a highly effective, instructional strategy that research indicates will best support student development.
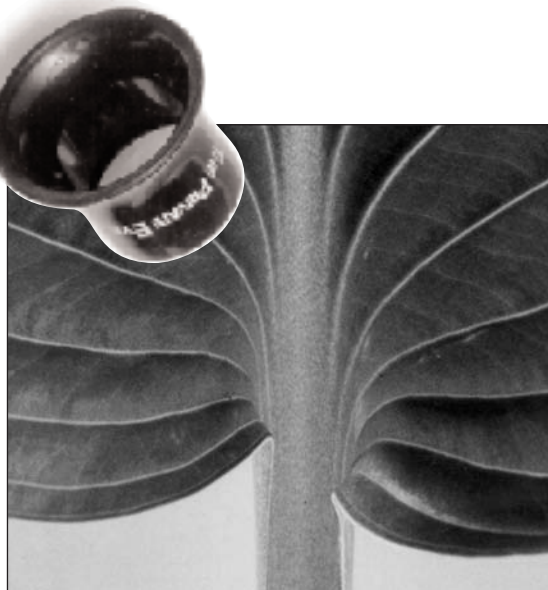
The Research Basis — Summaries:

The research basis of The Private Eye's instructional strategy was in place already in the 1960s (e.g., Piaget; Koestler) but has since been underscored by modern brain research and educational theorists and studies (e.g., Restak; Calvin; Gardner; Marzano). The research basis for The Private Eye is vast. For economy's sake, a short list of research studies or surveys and analysis of studies follows. We'll look at the first research document somewhat more closely.

 The work of **Robert J. Marzano, Debra J. Pickering and Jane E. Pollock in their 2001 book:** *Classroom Instruction that Works: Research-Based Strategies for Increasing Student Achievement***,** (Association for Supervision and Curriculum Development) reveals a startling tight match between "Categories of Instructional Strategies that Affect Student Achievement" (Figure 1.3, p.7) and The Private Eye approach. Nor is there merely a superficial correlation. As teachers and students move through The Private Eye's simple steps for writing, drawing and theorizing, they move through each of the most effective instructional strategies researched and listed by Marzano, et al. Research has targeted nine strategies here listed in order of significance:

 1) As students create and write their analogy lists (while loupe-studying an object, microscope studying an object, then studying with their unaided eye) they are **"Identifying similarities and differences"** between an object and "what else it reminds them of"-- an instructional strategy which has the highest effect on student achievement. (Discussion of "differences" becomes embedded, naturally, in the process.) Marzano, et al, include the making of metaphors (compressed analogies) and full-blown analogies as important instances of "Identifying similarities and differences."

     When students ask the corollary question of The Private Eye: "Why did it remind me of that?" -- they are guaranteed to reflect on the similarities and differences, the characteristics and properties of a subject. This metacognitive approach builds content knowledge and sets the stage for moving into refined inferences.

     2) Because the analogy lists are based on intensely close observation in a way that prevents clichés, the level of **"Summarizing and note taking"**— which has the second highest effect on student achievement—is at a high level.

     3) As for **"Reinforcing effort and providing recognition"** the instructional strategy with the third highest achievement effect, teachers find it easy to use and reinforce The Private Eye process in their classrooms. "No wrong answer" frees students so they bloom linguistically. The high student interest while using The Private Eye, the high-level results from student loupe-writing and extended writing (which meets four to five of the "6-Trait Writing Assessment" standards), the high-level results when students loupe-draw (Non-linguistic representations) along with the inherently interesting theorizing step... all this means the teacher will applaud

student work, and students themselves find their work interesting. Thus the teacher has a *self-reinforcing* instructional strategy, a strategy both simple and complex enough, with results that build student self-esteem, team esteem and teacher admiration.

During teacher training and in The Private Eye teacher guide teachers and students are encouraged to avoid responding with the word "good" to student efforts. More effective responses are discussed, eg., "Tell me more." "Why did it remind you of that?" "Interesting!" "Intriguing!" -- responses that keep the student looking, analogizing, drawing inferences, researching.

4) The instructional strategy with the fourth highest effect, **"Homework and practice"** could be worded: "Practice and homework." With The Private Eye, practice and repetition are basic since it is meant to be used year round, year after year, always with novel results from day to day, from subject to subject.

5) Drawing with a loupe —a standard part of The Private Eye process— is a form of **"Nonlinguistic Representation"** as described by Robert J. Marzano, et al. To summarize the research: "The more we use both systems of representation— linguistic and nonlinguistic—the better we are able to think about and recall knowl- edge." (p. 73) These "Nonlinguistic representations elaborate on knowledge" — specifically knowledge gained by a student when writing a loupe-analogy list as well as knowledge gained when connecting a loupe-activity to textbooks and other resources about the subject. In short, loupe-drawing is the creating of a graphic representation of the subject; it's a 2-D physical model, and loupe-drawing helps in the "generating of mental pictures" (Muehlherr and Siermann, 1996; Willoughby, Desmarias, Wood, Sims and Kalra, 1997). Writing with The Private Eye approach also generates mental pictures! The research to support loupe-drawing goes on and on: Drawing pictures and pictographs (Macklin, 1997; Newton, 1995; Pruitt, 1993); Engaging in kinesthetic activity (Aubusson, Foswill, Barr, & Perkovic, 1997; Druyan, 1997).

6, 7, 8, 9) So far we have seen that teachers and students who move through The Private Eye's simple steps for writing, drawing and theorizing practice the most effective instructional strategies researched and listed by Marzano et. al. (Figure 1.3, p.7). The list of effective instructional strategies expands to include:
• **"Cooperative Learning"** (students typically share louped discoveries with part- ners; they share their lists aloud and their resulting prose or poetry; they share loupe-assisted drawings and work in teams to develop hypotheses drawn from their lists of comparisons). • **"Generating and testing hypotheses"** and • using **"Questions, cues, and advance organizers"** (The Private Eye's questions and sequence). From the outset, when a teacher uses the Private Eye, • the **"Setting of objectives and providing feedback"** are clear: The Private Eye questions are simply stated; linguistically they match the way the mind works, and the goals are clear. The Private Eye objectives include: "Write 5-10 things it reminds you of" during each loupe-study session, eventually moving to at least ten each time (to develop close observation, fluency and ample material to work with). Students move to more complexity by explaining "Why it reminds them of_____" -- in which they consider the characteristics of phenomenon compared. Students then use their own analogy lists as clues to help figure out why the observed phenomenon is the way it is. ("If it reminds me of_____, how might it function or work like that

in some way?" Students ponder: "How would I test my guess?" -- then design and carry out tests and record results. They also loupe-draw for more closely observed data as well as for expression. And so on.

 Summary: The most effective instructional strategies described by Marzano, et al, are deeply embedded in the flow of The Private Eye sequence. Instructors can therefore feel confident that use of The Private Eye will maximize student achievement.

 The newly expanded ***How People Learn: Brain, Mind, Experience, and School***, published by the National Research Council in 2000, edited by John D. Bransford, Ann L. Brown, and Rodney R. Cocking. This book summarizes the best research/studies on learning and draws conclusions on how we should be educating our students. It underscores dozens of reasons for using The Private Eye in all subjects at all grade levels -- and that with repetition of the process, students will indeed develop the habits of mind embedded in The Private Eye:

   1) a sense of wonder; 2) a habit of looking closely (paying attention); 3) a habit of looking and thinking (inferring) by analogy; 4) the ability to change scale in one's thinking; and 5) a habit of using all these for solving problems, inventing designs, hypothesizing, theorizing --across disciplines. With The Private Eye students use these developing habits for improved writing, drawing and theorizing across subjects. The authors present their conclusions (listing major research studies throughout the compendium) and those conclusions support use of The Private Eye in classrooms K-16 through life. To name a few:

1) "**Neurocognitive research** has contributed evidence that both the developing and the mature brain are structurally altered during learning. ... These findings suggest that the brain is a dynamic organ, shaped to a great extent by experience and by what a living being does." (p. 235) Therefore, by using The Private Eye process systematically in schools K-16, students' brains will be altered with generalized habits of mind: looking closely (paying attention), thinking (inferring) by analogy, changing scale in thinking —and using these three processes for theorizing / inventing.

2) "**Transfer of Learning**" Consider research conclusions from
How People Learn:
    "A major goal of schooling is to prepare students for flexible adaptation to new problems and settings." This is called "Transfer of Learning."
    "The most effective learning occurs when learners transport what they have learned to various and diverse new situations."
    "Transfer can be explored at a variety of levels, including transfer from one set of concepts to another, one school subject to another, one year of school to another, and across school and everyday, nonschool activities." (p. 235)

    "Helping learners choose, adapt, and invent tools for solving problems is one way to facilitate transfer while also encouraging flexibility." ... "A metacognitive approach to teaching can increase transfer..." (p. 78)
    The Private Eye helps students develop "transfer of learning" in curriculum

content areas and as a habit of mind. Generating analogies (in the form of metaphors and similes) which students do in the first step of The Private Eye, then drawing cross-curricular applications, hypotheses, solutions, and insights from these analogies -- this process dramatically aids the "transfer of learning" for students and therefore accelerates student achievement.

"Learning with understanding is more likely to promote transfer than simply memorizing information from a text or lecture." (p.236) The Private Eye steps evoke "understanding" and transfer begins when students look at the world asking: "What else does it remind me of? What else? What else? What else?" and use the comparisons between one subject and another for insight and novel problem solving - both for academics and everyday solutions.

"Knowledge that is taught in a variety of contexts is more likely to support flexible transfer than knowledge that is taught in a single context." (p.236) Again, that hands-on objects are touchstones for practicing The Private Eye strategy, that these objects have obvious and unexpected connections to both the curriculum at hand and the students' own lives, that students observe, write, draw and theorize about these objects --- ensures "knowledge that is taught in a variety of contexts."

J.D. Bransford et al. goes on to note that it is not enough to make connections, **it is necessary to challenge misconceptions en route to developing accurate knowledge** of the world and expertise in a subject. (p.236) Using The Private Eye approach, as students move into theorizing in groups and singly, using ten to twenty associations (metaphors, similes, analogies) as clues to why something is the way it is, they find themselves challenging previous conceptions and misconceptions which were based on too little observation or rumor or myth. So they test their hypotheses, they learn the importance of evidence and even that interpreting evidence can vary from person to person and for accuracy requires a group effort. The Private Eye process provides an engaging and elegant version of the Scientific Method / Inquiry.

3) **"Competent and Expert Performance"** (p. 237)
   • "Relevant knowledge helps people organize information in ways that support their abilities to remember."
   • "Learners do not always relate the knowledge they possess to new tasks, despite its potential relevance." Bransford et al. says this "disconnect" results in learners with "less-organized knowledge, which tends to remain 'inert.'"
   • "Relevant knowledge" allows people to go beyond "information" to inferences.

The Private Eye's simple but sophisticated strategy allows a student to learn how to access, organize and make use of his/her own experience -- discovering just how relevant it is when framed up the right way: "What else does this object or event or feeling or movement remind me of? What else? What else? What else? And "If it reminds me of _____ I wonder if the two might work similarly? function similarly? or might I design a solution like that?"   —and so on.

Conclusion: There is a deep correlation between the research on *How People Learn* and The Private Eye strategy and curriculum.

 Science for all Americans, **by F. James Rutherford and Andrew Ahlgren (Oxford University Press, 1990), is the manifesto of science education reform in the United States** . It draws on the same overwhelming educational and cognitive research that *How People Learn* (Bransford, et all) draws on and comes to the same conclusions. For example:

   "People have to construct their own meaning regardless of how clearly teachers or books tell them things. Mostly, a person does this by connecting new information and concepts to what he or she already believes. Concepts—the essential units of human thought—that do not have multiple links with how a student thinks about the world are not likely to be remembered or useful." (p. 186) The Private Eye steps enable the student of any age to make "multiple links" to his/her previous experience each time students use The Private Eye to explore a subject.

Rutherford and Ahlgren (like J.D. Bransford et al.) note, however, that it is not enough to make connections, it is necessary to challenge misconceptions en route to developing accurate knowledge of the world. As students move into theorizing in groups and singly, using ten to twenty associations (metaphors, similes, analogies) as clues to why something is the way it is, they find themselves challenging and refining previous conceptions and misconceptions which were based on too little observation. The Private Eye process provides an enjoyable, engaging and elegant version of the Scientific Method / Inquiry.

Furthermore, Rutherford and Ahlgren note:
   "Sound teaching usually begins with questions and phenomena that are interesting and familiar to students, not with abstractions or phenomena outside their range of perception, understanding or knowledge. Students need to get acquainted with the things around them... and to observe them, collect them, handle them, describe them, become puzzled by them, ask questions about them, argue about them, and then try to find answers to their questions." (p.188)

Conclusion:
All this is efficiently accomplished in the process of using The Private Eye.

 Highly Influential Cognitive Processes
   Research shows that students need ample and continuous opportunities for **cognitive processes** that have been identified as highly influential and they need time in the classroom for **"students' metacognitive processes"** according to the analysis of research by Wang, Haertel & Walberg (1993/4) and McClaren and McIntosh (1999). Consider the following list of **cognitive processes, including metacognitive processes** that have been identified as highly influential for student achievement (quoted from **West, Farmer and Wolff, 1991).** Here we show how The Private Eye process embeds such major cognitive strategies (the cognitive strategy is in quotations)**:**
   1) The Private Eye strategy/steps provides "an advance organizer that helps the students build connections for new learning."
   2) As students answer the opening questions of The Private Eye while loupe-

studying some object then move into theorizing based on those answers, they are developing "chunking structures that invite the students to interact with information," do research and "make connections before they head into the processing of new information."

   3) The Private Eye, with its writing, drawing and theorizing approach, offers "a frame for organizing and processing information that invites the student to interact with the content and personalize the learning."

   5) The Private Eye enables and evokes thinking in "metaphor (analogy and simile) - a family of strategies that help students transpose meaning from one idea, concept, procedure, or event to another."

   7) When students loupe-draw during The Private Eye process they are using "Imagery strategies that help students store information in different ways."

   8) As students make associations using The Private Eye questions, they are employing "mnemonics devices that aid memory."

Conclusion: With "no wrong answer" to The Private Eye questions, with fascinating objects to loupe-explore, with a simple method of investigating that also creates wonderful poetry and prose and transfers into hypothesizing in all subjects -- The Private Eye provides ample and continuous opportunities for **cognitive processes** that have been identified as highly influential and for **"students' metacognitive processes,"** thus positioning students for high achievement.

🍎 *Sparks of Genius: The 13 Thinking Tools of the World's Most Creative People*, by Robert and Michèle Root-Bernstein (Houghton Mifflin, 1999) investigates the research and history of genius in its 400 pages. It makes the case that among the most important habits of genius are: keen observing, recognizing patterns, forming patterns, analogizing, transforming, and that our schools need to teach these habits of mind. The Private Eye develops all these habits and more. **The authors cite The Private Eye as one of the select Minds On Resources.**

1) In the chapter "Observing," the authors make the case that keen observation is not only a thinking skill ("So observing is a form of thinking, and thinking is a form of observing." p.43), it is a habit of mind of "genius," one as necessary to the writer and scientist as it is to the visual artist and that drawing such items as flowers, insects, coins (natural and manmade objects) with close attention to detail, over and over, builds this habit of genius. They make their case based on the actual records of writers and scientists. By the end of the piece the authors conclude: "For all these reasons we advocate explicit observational exercises in classes in every subject." (pp 40-48)

The Private Eye process gives students concentrated, explicit observational exercises in every class, every subject as it develops thinking by analogy and theorizing by inference from those analogies. As for loupe-drawing, it is an intense form of observational drawing; it develops a keen observer more quickly than ordinary drawing because the loupe cuts out all distractions for the observer.

Meanwhile loupe-drawing also breaks stereotypes and clichés about the object observed in the observer's mind. The authors of *Sparks of Genius* also note that the writing of poetry and literature – also a form of keen observation - helps scientists excel. (pp 40-48)

Throughout the chapter the kind of keen observation the authors are talking about includes both taking in the properties and characteristics of a thing and developing heightened AWARENESS of the subject… ("The purpose in practicing observation is to link sensory experience and mental awareness as closely as possible"). The authors make the case for observational drawing (e.g., loupe-drawing) saying it is as necessary to the writer and scientist as to the visual artist.

2) The chapter on "Analogizing" (pp136-159) bolsters the case that Kerry Ruef makes for analogizing in The Private Eye teacher guide (Ruef's book was published years before *Sparks of Genius.)* — that analogizing is at the heart of original work, inventions, solutions, be they literary, visual, musical, technological, mathematical or scientific. They give examples from the arts and sciences. Consider a few observations from *Sparks of Genius* which underscore why we use The Private Eye to develop "thinking by analogy."
   "Analogies are just as fecund in artistic design as they are in engineering and science. Scientists and artist, technicians and craftspeople, all analogize in the same way and for the same reasons. As Jacob Bronowski, physicist, poet, and humanist, put it, "the discoveries of science, the works of art are explorations— more, are explosions, of a hidden likeness." By means of analogy, the discoverer artist juxtaposes two phenomena, "two aspects of nature," in Bronowski's words, and "fuses them into one." (p. 145)
   "Analogizing shapes the literary endeavor itself as much as it shapes what is written." (p.147)

Conclusion: When your students use the loupe + The Private Eye's first questions in tandem --- they are practicing the heightened level of observation+connections the authors say is essential for excellence in the written arts, the dramatic and visual arts, and in the sciences. Using and generalizing The Private Eye analogizing approach, students are discovering and making their own analogies (typically in the compressed form of metaphors and similes) and employing them for advanced writing, design and solutions in all corners of the curriculum -- which accelerates achievement.

 The rationale for **Writing-across-the-Curriculum** has a huge research base**.** Research indicates students improve their understanding of disciplines as they write in the context of those disciplines. (Glatthorn 1981) —noted in "Qualities of Effective Writing Programs." ERIC Digest. Author: Holbrook, Hillary Taylor. Source: ERIC Clearinghouse on Reading and Communication Skills, Urbana, IL.
   With The Private Eye, loupe-looking, loupe-writing analogies and loupe-drawing become a springboard for compelling writing-across-the-curriculum in all genres. When students use The Private Eye approach to create their own observa-

tions of something they are exploring with an eye loupe, they are developing their vocabulary. Metaphors and similes serve as powerful descriptors, and morph into verbs and adjectives. Eg., If a student says, "the leaf's surface reminds me of fur," she might then compress the phrase to say the leaf is "furry," or the "furred leaf."

"Studies suggest that students learn vocabulary they select themselves." (Haggard, 1982.) This is relevant not only to the student with English as a first language, but also to **English Language Learners**. By loupe-drawing first, the playing field is levelled for ELD and ELL students. When they say *what else they are reminded of* in their first language, then translate into English, they are experiencing "the necessary control over their own learning for vocabulary development to take place." (Haggard, 1982.)

Reading and writing across subjects produce better thinkers (T. Tierney and Shanahan (1991).

"Assuming that students gain new knowledge by making associations with prior knowledge, the writing activities commonly used across the curriculum give students the opportunity to make those connections." (Walker, 1988; Self, 1989; Barr and Healy, 1988; Kurfiss, 1985; Steffens, 1988.)

In the hectic pace of the curriculum, The Private Eye allows students the chance to assimilate information, make connections and face what intrigues and confuses them. In other words they use The Private Eye writing as "a way into or means of learning, a way into understanding through articulating." (Hamilton-Wieler,1988).

Most importantly, however, research supports that writing to learn improves higher-order reasoning skills. (Gere, 1985) As Barr and Healy (1988) summarize the research, a "study of writing achievement across the curriculum attests to the fact that writing improves higher-order reasoning abilities." —Source: ERIC Clearinghouse on Reading and Communication Skills, Urbana, IL

 6-Trait Writing Assessment: 6-Trait Writing Assessment has become widely accepted as one of the clearest ways to assess student writing. At least four of the traits are directly developed using The Private Eye: Detail and specificity of word choice; Voice; Ideas; Internal organization. Meeting another of the six traits: In writing generated using The Private Eye, students have meaningful work on which to practice grammar conventions. The lead teacher in developing "6-Trait Writing" was Vicky Spandel, formerly at NWRL, now with Write Traits/Great Source. Of The Private Eye approach Spandel says: "Writers are people who see what many others miss. The Private Eye teaches us all to look at the world as writers do."

 The Private Eye's steps and outcomes meet **the core standards of the NCTM, NCTE and NSTA.** (See the relevant chapters in *The Private Eye—(5X) Looking/Thinking by Analogy*, Ruef, 1993) and the document: "Using The Private Eye to teach the Big Ideas in Science" for a detailed explanation of how The Private Eye addresses and teaches the Big Ideas as presented by the National Science Teachers Association.

 Howard Gardner, *Frames of Mind* **:** *The Theory of Multiple Intelligences*
(Basic Books, 1983) in developing his theory of **Multiple Intelligences**, empha-
sizes the need to appeal to a range of modalities. The Private Eye's questions and
the loupe and the up-close to nature experience give students access to using
every sense for creativity, thinking skills and content development.


 Creativity across the Curriculum
"Creativity involves fluency, flexibility, originality, elaboration," according to the
Center For Creative Learning, Inc. Characteristics of creativity include: "Generating
ideas, openness, the courage to explore ideas, and listening to one's inner voice."
A few of the research studies and creativity tests underpinning the characteristics
listed above:

   Cramond, B. (1998). The Torrance Tests of Creative Thinking: Going beyond
the scores. In: A. S. Fishkin, B. Cramond, & P. Olszewski-Kubilius (Eds.).
Investigating creativity in youth: Research and methods. (pp. 307-327). Cresskill,
NJ: Hampton Press. Rosenthal, A., DeMers, S. T., Stilwell, W., Graybeal, S., &
Zins, J. (1983). Comparison of interrater reliability on the Torrance Test of Creative
Thinking for gifted and non-gifted students. Psychology in the Schools, 20(1), 35-
40. Runco, M. A. (1986). Divergent thinking and creative performance in gifted and
non-gifted children. Educational and Psychological Measurement, 46, 375-384.
Runco, M. A. (1991a). Divergent thinking. Norwood, NJ: Ablex. Runco, M. A.
(1991b).

   Conclusion: Using The Private Eye, students develop fluency, flexibility,
originality and elaboration. They learn to truly explore ideas and how to listen to
their own "inner voice" —in both verbal and visual forms, across disciplines.

 It is not possible to overstate the importance of teaching students to generate
their own analogies (metaphors and similes are compressed analogies) which they
do while loupe-looking and answering the first simple Private Eye questions: "What
else does it remind me of? What else? What else? What else?" and how to use
those analogies to make inferences, hypotheses, designs, solutions... which
students practice using the next Private Eye question: "If it
reminds me of _____ might it function or work like _____
in some way?" (Of course the point of using The Private Eye
strategy is to generalize it throughout the curriculum and life,
with and without a loupe.)

   Consider what nobel prize-winning scientist, Joshua
Lederberg, thinks are the main habits of mind of a scientist:
"I don't think there is one logic for science and another logic
for the commonsense world. If there were, we would be in
real trouble. .... I'd say the ability to discover analogies, the
ability to generalize, the ability to strip to the essential attrib-
utes of some actor in the process—the ability to imagine
oneself inside of a biological or other situation—these are
some of the pretty obvious talents." —from: *The Search for
Solutions*, Horace Judson, (Holt, Rinhart & Winston, 1980.)
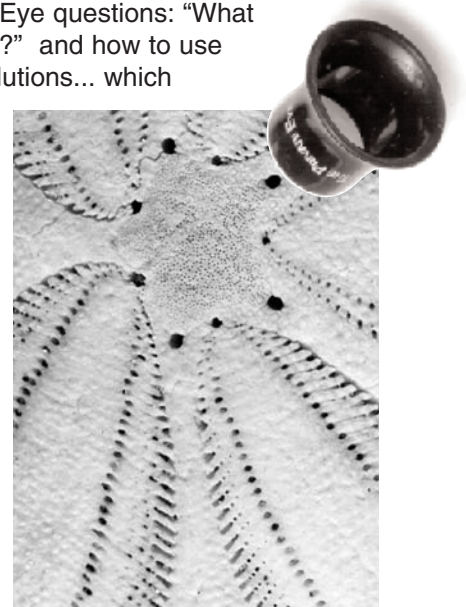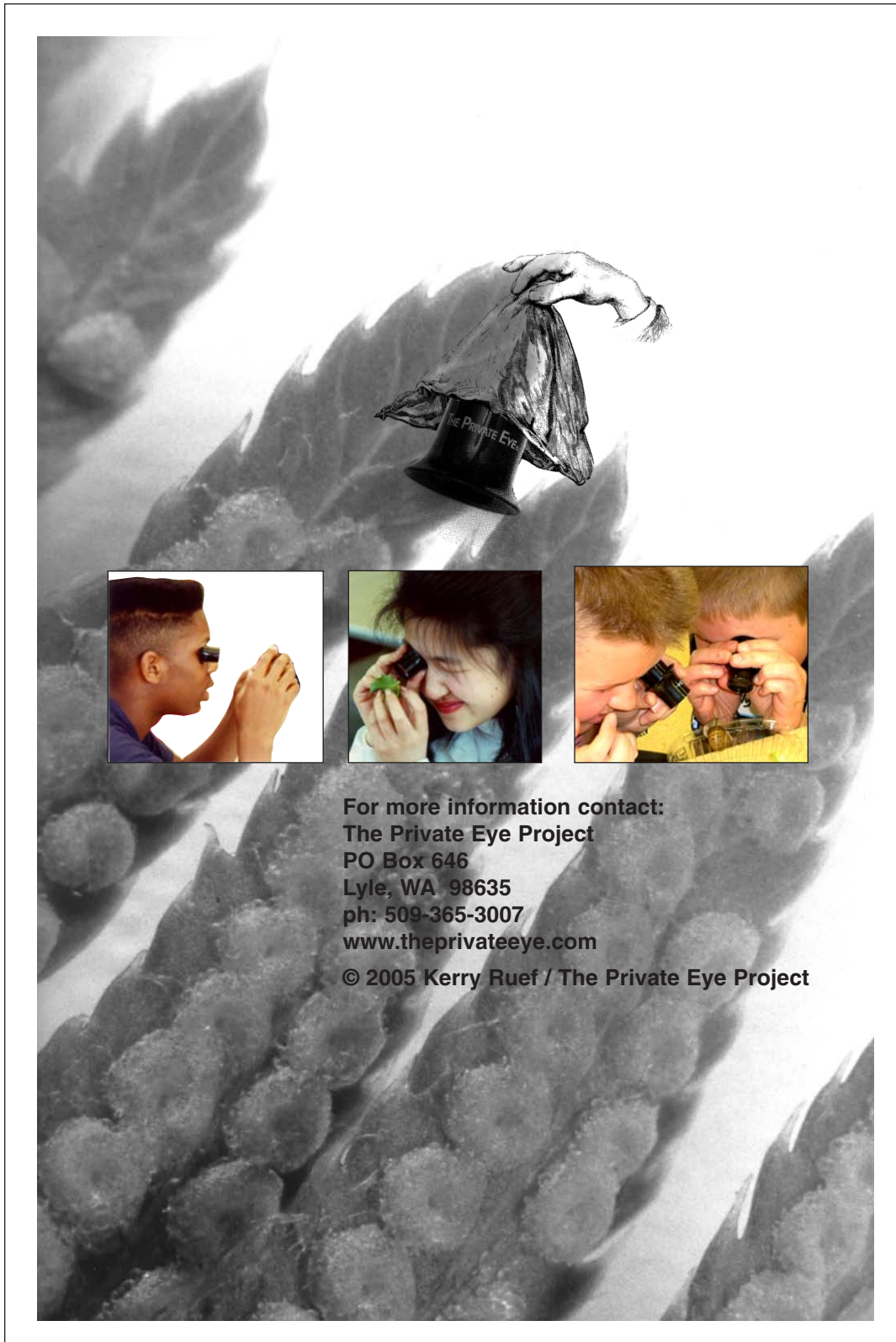
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