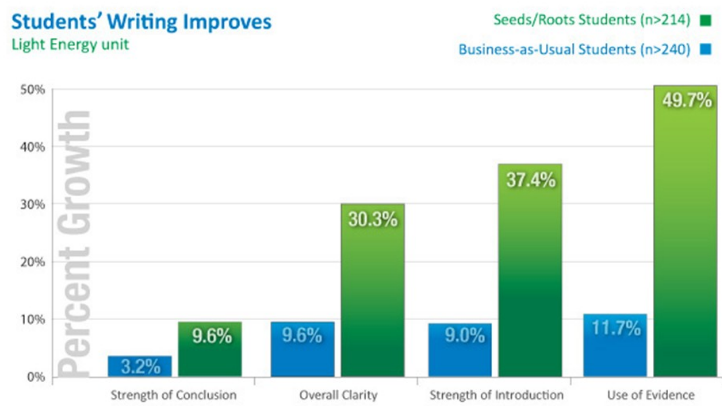
January 2012

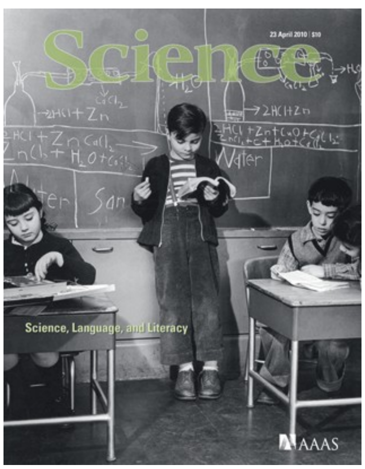
Reporting of
February 6, 2012
Science/Literacy PD

Focus on Informational Text



Independent Evaluators from the Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA, found that 3rd and 4th grade students receiving *Seeds of Science/Roots of Reading* instruction improved at least 3 times as much as other students in various aspects of science writing.

It matters who you listen to. In the scientific community, if it's published in *Science,* you listen!



Ask scientists their highest professional goal and you will likely hear the same thing over and over, "I want to be published in *Science*." *Science* is the most respected scientific journal in the world and is published by AAAS, the American Association for the Advancement of Science. So when *Science* published a special issue, **Science, Language, and Literacy**, in April 2010, focusing on the connection between learning science in school and the acquisition of language and communication skills, science+literacy moved to the forefront of the scientific community. The emphasis of the special issue is the strong benefit of teaching science and literacy in the same classroom whenever possible. I love the comments of Bruce Alberts, Editor-in-Chief of *Science*, "In the United States, this would be viewed as a radical proposal. (He's referring to teaching science and literacy as one course of study.) Unfortunately, the great majority of Americans are accustomed to science classrooms where students memorize facts about the natural world and, if they are lucky, perform an experiment or two; in language arts classes, students generally read fictional literature and write about it in fossilized formats such as 'compare and contrast.'"

Connecting science with literacy in an authentic and meaningful way increases proficiency in both content areas. We read and write about *something* and that *something* must be relevant to us in order to create. Science investigations provide relevant experiences from which students can use to write.

One of the articles in the special issue is authored by P. David Pearson. Pearson is at the forefront of research for literacy and is one of the two creators of the Seeds of Science, Roots of Reading program. In his article, he asks. "What is scientific literacy?" and "Why does it matter?" It matters because our nationwide goal in education is to develop individuals who are college and work-force ready. He states, " When literacy activities are driven by inquiry, students *simultaneously* learn how to read and write informational texts and to do science."

We are pursuing more connection between science and literacy through informational text. Continue reading for research about how integrating scientific investigations with reading and writing enriches your literacy block.

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Where's my grade level science materials in this newsletter?

After the powerful February 6th professional development on how to connect science and literacy, I felt strongly that I should provide a contextual framework of the research that supports making this connection.

Context. That one word sums up why science and literacy are such a natural fit. Science provides the context for authentic, relevant literacy practices, such as reading and writing. And literacy provides the means by which science communicates its practices and findings. These two disciplines are already inextricably connected. Through pursuing purposeful instruction where we read and write informational text using science as our context, we validate this connection.

For more information, scan the QR code.

Seeds of Science/Roots of Reading Three Guiding Principles

1. Engage students in firsthand and secondhand investigations to make sense of the natural world.

Scientists learn about the natural world in a variety of ways. Scientists conduct firsthand investigations, they make observations, conduct tests and experiments, model scientific phenomena, gather data, and search for evidence. Scientists also rely on what they learn from secondhand sources, such as books, articles, reports, presentations, and correspondence with peers.

Reading and scientific investigation are both acts of inquiry-students read and investigate to find out. They learn about the world and develop their own work by reading science books and articles and interpreting and critiquing other scientists' data and claims. Scientists work iteratively between firsthand (experiential) and secondhand (text) information, and the *Seeds/Roots* approach similarly provides students with an authentic balance of learning opportunities from both firsthand investigations and secondhand sources.

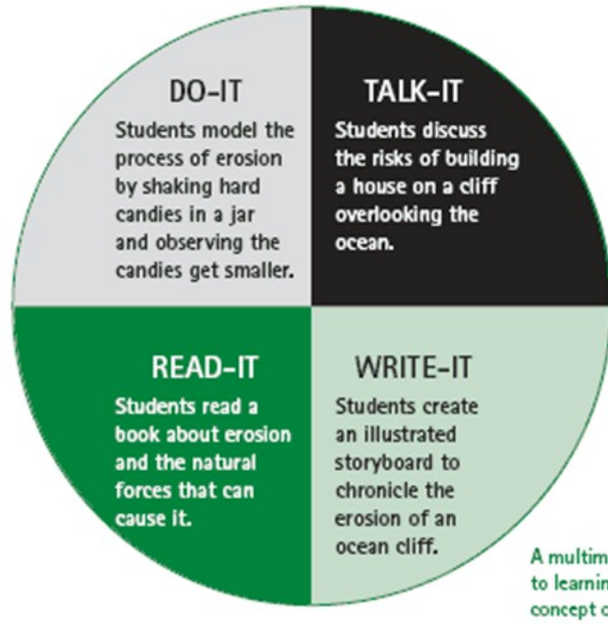
Each unit provides opportunities for students to find, evaluate, and interpret evidence both in firsthand situations and from secondhand sources, especially the student science books. Negotiating this interplay between firsthand secondhand sources of information is something we do all of our lives, even if we don't choose a career in science. We learn a new skill like driving both by reading and learning the traffic laws and by practice actually driving. Making sense of the world and navigating daily life require a lot of skill in reconciling different sources of evidence, some of it gathered through experience and investigation (firsthand) and some from books, media, and conversations (secondhand). In the *Seeds/Roots* curriculum, students have the opportunity to develop all of these skills.

2. Employ multiple learning modalities.

The *Seeds/Roots* approach expands the classic inquiry science instructional model. In most inquiry science approaches, students engage in firsthand experiences, such as systematic observation or experimentation, and reflect upon those experiences, usually through discussion.

Seeds/Roots employs a multimodal instructional model called the Do-it, Talk-it, Read-it, Write-it approach. Students engage with important learning goals in science and literacy through multimodal experiences.

For example, students might learn about an organism and its adaptations by observing that organism and its behavior in a firsthand way, by discussing their observations and inferences with others, by reading about what others have observed or about things that are not observable in a firsthand way, and then by writing to communicate what they have learned and still wonder. Students engage with each unit's priority learning goals through at least three out of the four modalities.



A multimodal approach to learning about the concept of erosion

3. Capitalize on science-literacy synergies.

The *Seeds of Science/Roots of Reading*™ approach capitalizes on potential synergies between science and literacy. Synergies might be thought of as the "sweet spots" between the two domains: the places where science and literacy share highly complementary, sometimes identical, learning goals or cognitive processes.

Seeds/Roots units are designed to help students learn essential science concepts and how to express these concepts using academic language, develop a set of cognitive skills that are generative and transferable across disciplines, and come to know the nature and practices of science and literacy.

Through the program's emphasis on these shared strategies in science and literacy, students begin to understand that reasoning and strategic meaning-making cross curricular boundaries. This helps to develop enduring dispositions, rather than promote isolated skills. Students learn to bring their inquiry skills and comprehension and composition strategies to bear on issues and problems they encounter across the curriculum and even outside of school.

Science or Literacy?	Science	Literacy
Making predictions	•	•
Posing questions	•	•
Making explanations from evidence	•	•
Making inferences	•	•
Summarizing	•	•
Searching for information in text	•	•
Communicating conclusions	•	•
Engaging in discourse	•	•
Constructing meaning	•	•
Interpreting meaning	•	•
Writing reflections	•	•

http://delta-edu.com/seeds/principles.shtml

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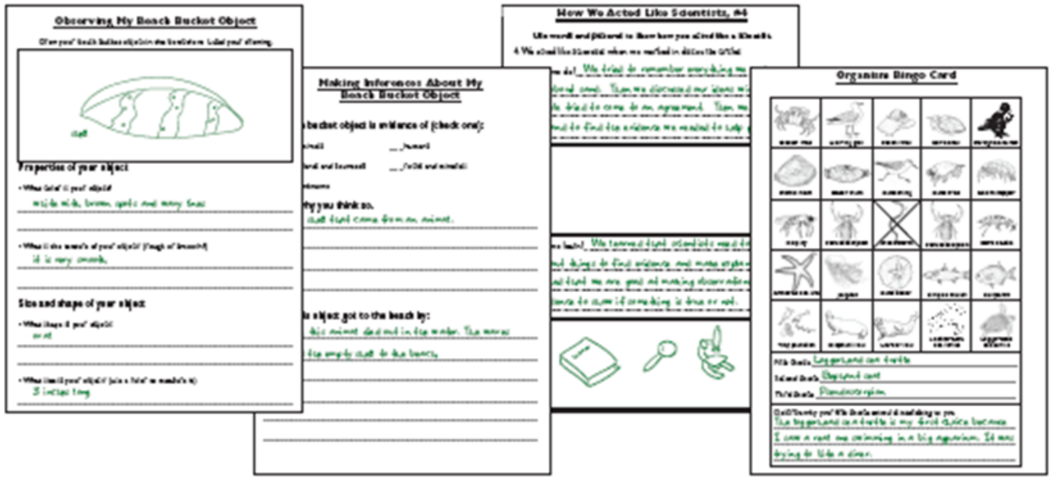
Investigation Notebooks



Reduced versions of the Investigation Notebook pages, with possible student responses, appear on the teacher guide pages where you'll be using them.

Each *Seeds of Science/Roots of Reading* unit includes a student Investigation Notebook. These notebooks provide students with a place to keep track of their data and their sense-making in a way that is authentic to scientists' practice of keeping lab notebooks.

Research shows that such notebooks are key to promoting, scaffolding, and sharpening students' inquiry practices.

Among the notebooks' many features are:

- **Investigation pages** guide students through many of their firsthand experiences, with space for recording observations and data. They return to and update many of these pages as they progress through their investigations.
- **Getting Ready to Read and Reading Reflections** provide optional support for students' independent or guided reading. These are especially important as scaffolds for English Language Learners.
- **Daily Written Reflections** provide optional reflective writing prompts that focus on the unit's key concepts. Research suggests that the practice of using student notebooks for reflection promotes student understanding of science.

We will go through these Investigation Notebooks together at the science PLC get-togethers. Of particular interest are the book-specific Getting Ready to Read student worksheets for the process of preparing, reading and reflecting on the text. In preparation to read, students are pre-assessed to determine their prior knowledge and misconceptions about the key concepts in the book. Before reading, students mark whether they agree or disagree with several statements. When used the day prior to reading, this information is a powerful formative assessment tool for the teacher to use to guide discussion in both science instruction time and reading groups. In science, this information frames for the teacher what prior knowledge the students bring to the lesson as well as what misconceptions they hold that affect their learning. In literacy, this information gives the teacher insight into how the lack of prior content knowledge might hamper the student's ability to read and understand the text as well as what student questions might arise from stumbling blocks occurring due to misconceptions. ***Just as a student's below level reading comprehension influences their ability to learn the science content, a student's below level science content knowledge can influence their ability to fully understand and read the informational text.***

http://delta-edu.com/seeds/investigation.shtml

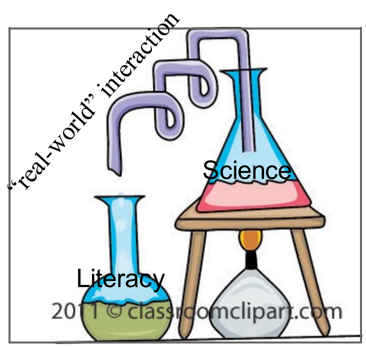
What does science bring to literacy?

CONTEXT!

FIRSTHAND EXPERIENCE!

1. Science investigations are engaging.

2. Students excel when they read and write about personal experiences and science investigations provide authentic and relevant personal experiences. Inquiry serves as the "real-world" interaction ingredient.



3. Most future jobs will require some, if not a considerable, level of STEM literacy. According to an ASQ survey last month, more than half (53 percent) of parents of 10-17 year olds interested in STEM careers expressed concerns about their child pursuing a STEM-related career path. The biggest issue, reported by 26 percent of parents, is that their child is not being prepared enough (to be successful in a STEM-related career.)

4. A new report from the Georgetown University Center on Education and the Workforce shows that 65 percent of Bachelor's degrees in STEM (science, engineering, technology and mathematics) occupations earn more than Master's degrees in non-STEM occupations. Similarly, 47 percent of Bachelor's degrees in STEM occupations earn more than Ph.D.s in non-STEM occupations. Furthermore, even people with only STEM certificates can earn more than people with non-STEM degrees; for instance certificate holders in engineering earn more than Associate's degree-holders in business and **more than Bachelor's degree-holders in education.** (I just had to bold and underline that statement. It provides us with context regarding how essential our role is in providing our students with the scientific literacy skills to be successful. The world is changing!)

For the research behind how connecting science and literacy build better student understandings, scan the QR code.

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Top 10 messages from teachers about science and literacy

How does literacy provide that essential secondhand experience for students?

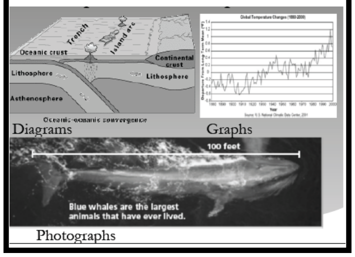
Literacy engages students in secondhand investigations for one of three purposes:

1. to bolster and reinforce learnings from firsthand investigations,

2. to take students on vicarious journeys (deep in the ocean, far into outer space, or inside a volcano) that cannot otherwise be taken in our classrooms, and

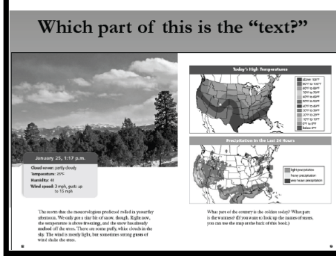
3. to provide students with an opportunity to apply the inquiry-based skills and processes acquired in firsthand investigations to new domains of inquiry (e.g., drawing conclusions based on reading an account of an investigation).

#1 Science is replete with visual representations, and students need support interpreting them.

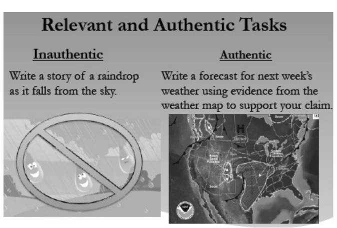


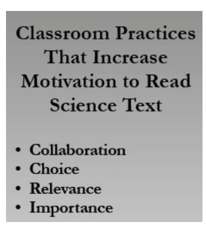
#2 Student-to-student talk opportunities are invaluable to learning in science.

#3 Reading science text means reading more than just the words on the page.

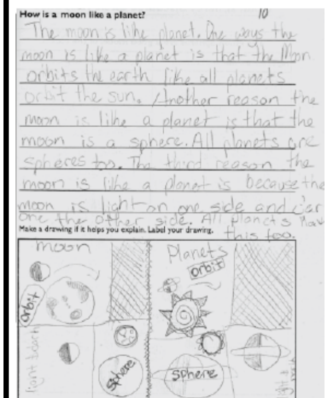


#4 Supporting motivation is as important as teaching content knowledge.

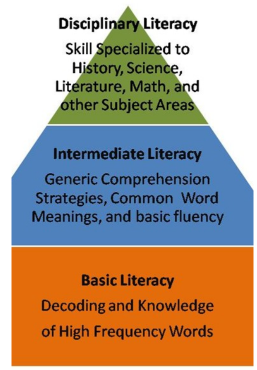




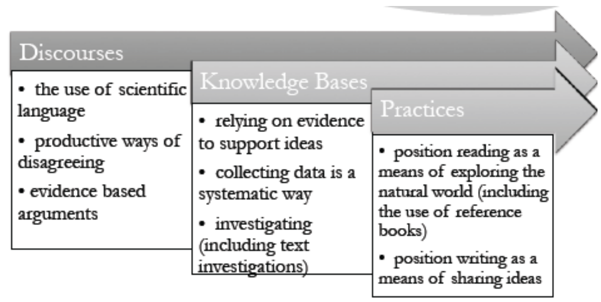
#5 Writing helps students work out their thinking.



#6 A disciplinary literacy approach to science is a powerful way to teach and learn.



#7 Use literacy to help students navigate science (a complex network of ideas).



#8 Well-designed literacy activities widen all students' access to science.

Science Word	Everyday Word
classify	group
predict	guess
observe	look, notice
demonstrate	show
explain	tell
record	write down
evidence	clues, proof

#10 You can do it!

#9 Learning science IS learning to read, talk, write, and think like a scientist.

Next Generation Science Framework

DIMENSION 1:
SCIENTIFIC AND ENGINEERING PRACTICES

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

CCSS Standards for Writing in Science

WRITING: Text Types and Purposes

CCR 1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.1.6	WHST.1.6-8
Write arguments to support claims with clear reasons and relevant evidence.	Write arguments foc[...]
a. Introduce claim(s) and organize the reasons and evidence clearly.	a. Introduce claim(s[...] acknowledge and [...] alternate or oppo[...] reasons and evidence logically.
b. Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.	b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
c. Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons.	c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
d. Establish and maintain a formal style.	
e. Provide a concluding statement or section that follows from the argument presented.	