

A Natural Fit: Scientific Inquiry and The Integration of Reading and Writing

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Friday March 30, 2012

10:00am-11:30am

A Natural Fit:

The Integration of Science & The Common Core

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Session Goal

**To provide ten practical strategies
you can readily use to integrate
reading and writing in science while
naturally addressing the English
Language Arts Common Core
Standards for Reading & Writing in
Science**

Today's Organizer

- ▶ You have each received an organizer with ten boxes to take notes throughout the session.

Top Ten Things I can readily use to integrate reading and writing in science while naturally addressing the English Language Arts Common Core Standards for Reading & Writing in Science

- ▶ **Where can I find the resources used during the session?**
- ▶ All activities and today's PowerPoint® will be posted at: www.carolina.com.
- ▶ Science misconception books referenced are available from NSTA Press.
- ▶ To learn more about the instructional materials used during today's session, please visit the Carolina booth.

You might be asking . . .

- ▶ **What Common Core Standards for Science Literacy?**
- ▶ **Is There A Connection to the Next Generation: A Framework for K–12 Science Education?**



Dimension One: Practices

Obtaining, Evaluating, and Communicating Information

“Science cannot advance if scientists are unable to communicate their findings clearly and persuasively or learn about the findings of others.”

A Framework for K–12 Science Education



Literacy Is Essential To All

Scientific & Engineering Practices
Asking Questions & Defining Problems
Developing & Using Models
Planning & Carrying Out Investigations
Analyzing & Interpreting Data
Using Mathematics, Information & Computer Technology, & Computational Thinking
Constructing Explanations & Designing Solutions
Engaging in Argument From Evidence
Obtaining, Evaluating, and Communicating Information



Emphasis of the Common Core

- ▶ Shared responsibility for students' literacy development
- ▶ Proficiency in reading complex informational text independently
- ▶ Centrality of writing to most forms of inquiry

*Common Core Standards for English Language Arts & Literacy in History/Social Studies,
Science & the Technical Subjects*



The Common Core: ELA & Literacy in History, Social Studies, Science & Technical Subjects

Grade	Literature	Informational Text
4	50%	50%
8	45%	55%
12	30%	70%



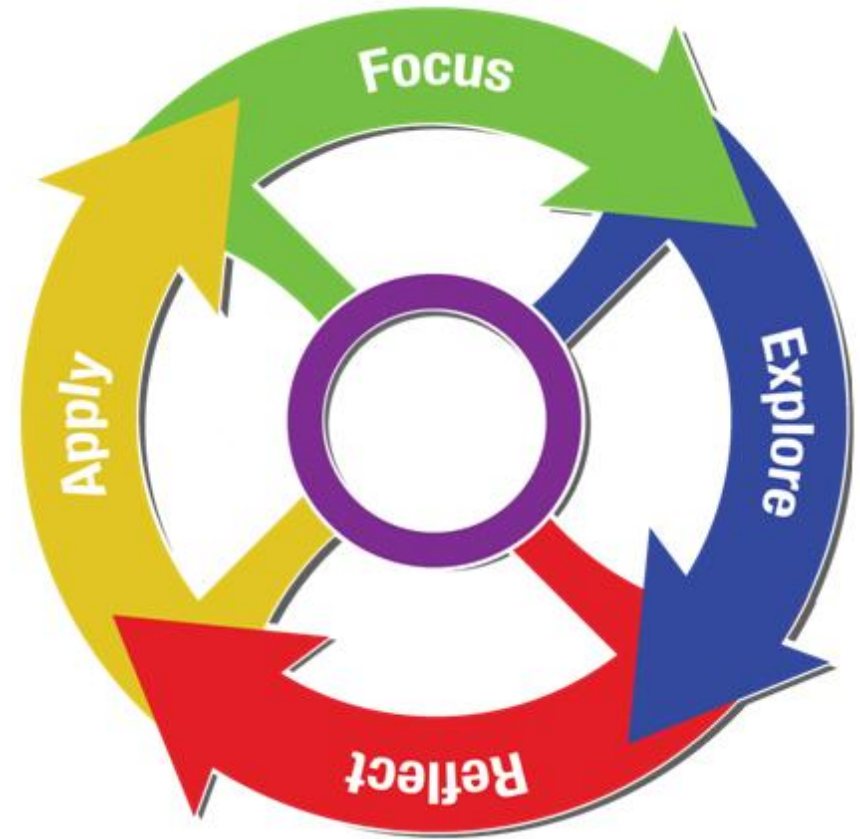
The Common Core: ELA & Literacy in History, Social Studies, Science & Technical Subjects

Grade	To Argue	To Explain	To Convey Experience
4	30%	35%	35%
8	35%	35%	30%
12	40%	40%	20%



Number One

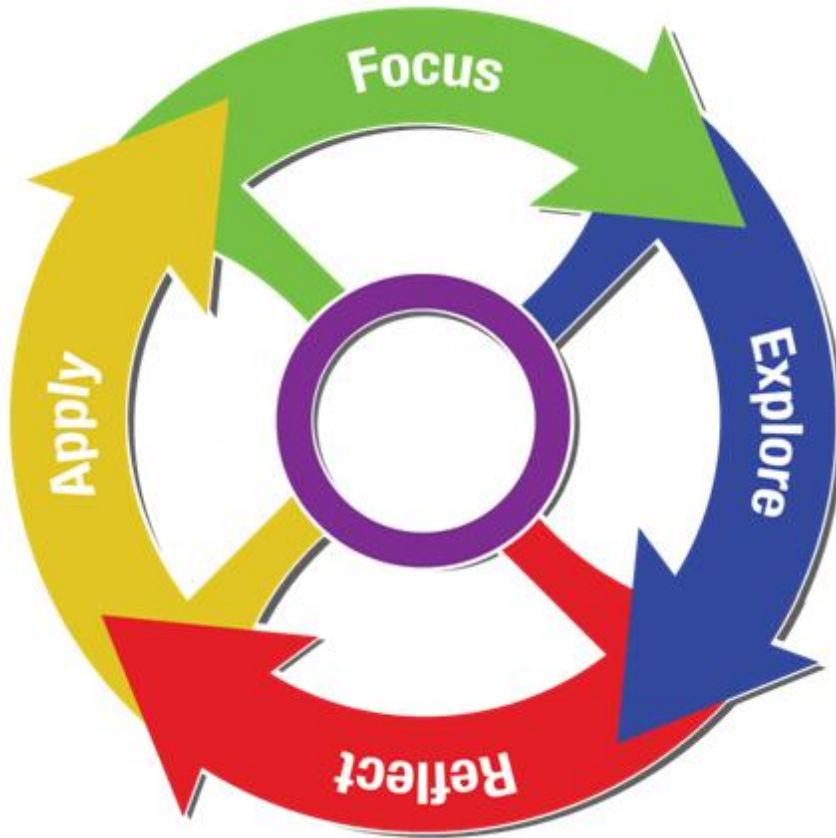
**When and Where
Should I Integrate
Reading & Writing in
Science Instruction?**



Number One: Integration – When? Where?

YOUR CHALLENGE:

Analyze the experience/vignette and compare it to a traditional approach. Think about the integration of reading and writing!



The Integrated Vignette

FOCUS

- ▶ Start by introducing the engineering challenge.
- ▶ Pre-assess.

EXPLORE

- ▶ Construct understanding experientially. *Note: vocabulary is introduced by function before domain-specific words are applied.*
- ▶ Results are recorded in journals.
- ▶ Domain-specific words are applied to categories (conductors/insulators).

REFLECT

- ▶ Look for multiple definitions of the words.
- ▶ Use Glossary: Evaluate which definition applies to science.
- ▶ Students create own definitions for domain-specific words and record them in journals.
- ▶ Read about Edison's challenge to find a conductor for his lightbulb.
- ▶ Reflect upon Edison's perseverance and resilience in journals. Support journal entry with textual evidence.

APPLY

- ▶ Students apply their understanding of conductors and insulators to the engineering challenge.



Number Two: Blend Core Disciplinary Knowledge, Cross Cutting Concepts, & Practices as Students Write Reflectively in Notebooks

- ▶ **Core Disciplinary Knowledge**

- ▶ Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light.

- ▶ **Practices**

- ▶ Begin with a problem
- ▶ Analyze systems
- ▶ Systematically collect data
- ▶ Analyze data
- ▶ Design solutions

- ▶ **Cross Cutting Concepts**

- ▶ Systems
- ▶ Energy and Matter Flows
- ▶ Cause and Effect
- ▶ Structure and Function



Number Three: Use Common Core Standards to Inform Purpose for Reading & Writing in Science

FIFTH GRADE:

- ▶ Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

What happened to the frogs? Animal Studies

MAIN IDEAS

- ▶ Scientists set up systematic studies to collect data.
- ▶ Scientists use evidence from data to support claims.



Number Three: Use Common Core Standards to Inform Purpose for Reading & Writing in Science

Process to Address the Standard:

- ▶ Read to determine main ideas.
- ▶ Challenge students to find key details to support the main ideas.
- ▶ Challenge students to summarize the text using main ideas to organize their thoughts.



Number Three: Use Common Core Standards to Inform Purpose for Reading & Writing in Science

► Time to Practice!

1. Preview the Common Core Standards for a grade level of interest.
2. Select one sample of informational text at your table.
3. Look for ways you could integrate the Common Core Standards using the informational text you selected.
4. Share your findings at your table.



Number Three: Common Core Challenge

- ▶ Select a book of interest at your table.
- ▶ Determine grade level band using the colored matrix.
- ▶ Select a Common Core Standard for a grade within the band from the Key Ideas Section (blue).
- ▶ Identify a place in the text that would be ideal to teach the Common Core Standard.
- ▶ Share at your table.



Number Four: Graph As Story

- ▶ Integrate reading and writing while interpreting graphs.
- ▶ Challenge students to think of a graph as a story.
- ▶ Provide a labeled graph without a title and caption.
- ▶ Challenge students to create the **Title & Caption** for the graph.
- ▶ Challenge students to write the text “story” that might appear in a book or article next to the graph.

Number Four: The Graphing Challenge

- ▶ Select one of the graphs or tables in the folder labeled “Graphs & Tables.”
- ▶ Write a few **Key Details** that you would include in the story of the graph or table.
- ▶ Share with the colleagues at your table.



Number Four: Teach Graphs as Stories

- ▶ Use the **Graphing Continuum** on page 13 in your **Common Core Toolkit**.
- ▶ Challenge students to create graphs on their own using data recorded in tables in their student notebooks.
- ▶ Use the **Graphing Continuum** to assess.



Number Five: Use Scientific Drawings to Initiate Writing in Science Notebooks

“Students need not only to do hands-on science and talk and write science in words; they also need to draw, tabulate, graph, geometrize, and algebrize science in all possible combinations.”

Lemke in *Crossing Borders*, 2004



Number Five: Why Scientific Drawing?

Many scientists have been described as visual-spatial thinkers.

- ▶ “Michael Faraday’s visualization of lines of force surrounding charged objects and magnetic poles is frequently cited as an example of the use of imagery in explanation of phenomena.”

(Mathewson, 1999, p.37)

- ▶ “Because of the detailed annotations, the drawings became credible quantitative evidence about satellite motion, not merely still-land sketches of telescopic views.”

(Tufte, 2006, p.13)



Number Five: Why Scientific Drawing?

- ▶ “Drawing is a way of thinking, reflecting, and processing information. It supports the development of visual-spatial thinking.”

(Grall Reichel, 2010, p.43)

- ▶ Without drawing we miss the opportunity to challenge students to apply new vocabulary.
- ▶ **MOST IMPORTANTLY** we miss the opportunity to provide the time for the quintessential processing time needed before writing.



Number Five: Scientific Drawing Continuum

Scientific Drawing

I drew what I saw.

I labeled all the parts of the drawing.

I gave the drawing a title.

I made the drawing clear enough to see all the parts.

My drawing is neat and easy to follow.

I used my science words to label my drawing.

I wrote a sentence to describe my drawing.

Scientific Drawing
Continuum (Toolkit, page 12)

Create an **anchor chart** for your grade band.

Paste grade band in the front of student notebooks.



Number Six: Use ICE Charts To Focus Writing

Support the writing process in notebooks by using an ICE chart.

- ▶ **Ideas**
- ▶ **Claims**
- ▶ **Evidence**

Ideas	Claims	Evidence
When salt dissolves in water it disappears.	Salt does not disappear when it dissolves.	When we evaporated the salt water there was salt in the dry petri dish.



Number Seven: “Write to Argue”

- ▶ Use the “Write to Argue” Continuum in your Common Core Toolkit.
- ▶ Encourage students from the early years to write claims supported by evidence.
- ▶ In the middle grades and beyond, consider the Common Core distinction between persuasive writing and argumentation.
- ▶ The Common Core states that Arguments should be void of opinion; they should be supported with evidence and written in an objective voice.

Number Eight: Use Writing Prompts

Examples:

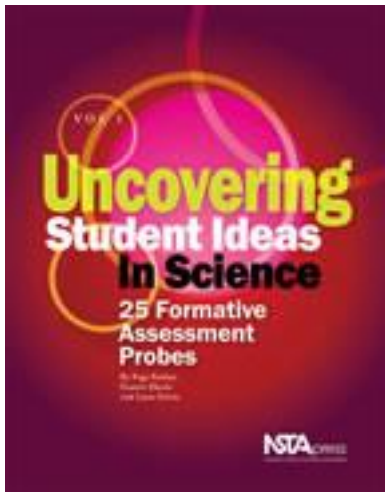
Properties of Matter – Determine a Mystery Object –
Support with evidence why you think your object is
_____.

Wright Brothers – Support with textual evidence that the
Wright Brothers made a lasting contribution to society.

Scale Model Space Sequence – Write a letter to the
illustrator – Support with evidence what is wrong with this
picture.



Number Nine: Use Assessment Probes



- ▶ Many of the assessment probes provide opinions of different people. These opinions are based upon common misconceptions.
- ▶ After students explore the concept, challenge them to write to an individual who has a misconception.
- ▶ Tell students to support their writing with evidence from their hands-on experiences.

Number Ten: Write to Inform

Use the “Write to Inform” Continuum in your Common Core Toolkit.

Encourage students to revise and edit as they use the continuum as a reflective tool.

Write to Inform Challenge

- ▶ Use the informational text at your tables as a starting point. How could you use the text to initiate writing to inform?

Final Note!

REMEMBER! Scientists and engineers advance their fields by seeing the **extraordinary, not the ordinary.**

Please Note: If you have questions, here is the most expeditious way to reach me.

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