

Practical Ways to Use Science As a Context for Improving Student Writing

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Workshop Presented By
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Seeds of Science/Roots of Reading @ Lawrence Hall of Science

Where We're Heading

- We'll explore
 - why integrating informational writing in Science is beneficial
 - examples of different forms of scientific writing
 - attributes common to all scientific writing

Where We're Heading

- We'll break out and discuss the component of strategies for teaching and assessing three specific genres of informational writing
 - Scientific Descriptions
 - Scientific Explanations
 - Scientific Comparisons
- We'll reconvene as a whole group to summarize instructional ideas

Workshop Overview

- **Whole Group Discussion of Writing in Science (30 minutes)**
 - **Break-Out Session I (35 minutes)**
 - **STRETCH BREAK (10 minutes)**
 - **Break-Out Session II (35 minutes)**
 - **Break-Out Session III (35 minutes)**
 - **Whole Group Discussion - Summarize instructional ideas (15 minutes)**
- (You'll have a chance to attend all three breakouts!)

Why Integrate Writing and Science?

- Informational writing gets short changed in our school day, especially in science (*National Commission on Writing, 2002*).
- Writing supports knowledge of content and the writing process (*Rivard, 1994; Prain & Hand, 1996*).
- Writing is a practice of science (*Kelly, Chen, & Prothero, 2000; Yore & Hand, 2002*).
- Writing is an important academic and communicative skill (*Alexander & Jetton, 2002; Bransford, Brown, & Cocking, 2004*).

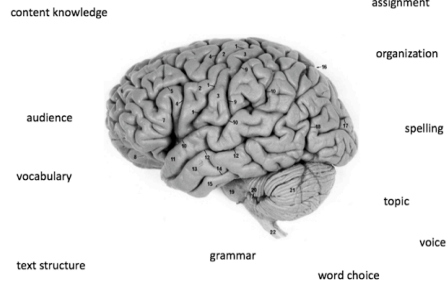
Tendencies in Instructional Practice

- We ask students to write, but may not provide instruction that supports writing development.
- Due to time constraints the instruction and practice of writing in schools is increasingly shortchanged, especially in science.
 - Writing instruction takes time
 - The act of writing takes time
- Writing is difficult for many students, and we may choose to invest time in other ways.

Writing: Implications for School and Beyond

- Academic and workplace achievement is dependent on the ability to write, read, and speak well (*Alexander & Jetton, 2002; Branford, Brown, & Cocking, 2004; Moje, 2007*).
- Students need to be able to write effectively to communicate in life and work (*Moje & Tysevar, 2010*).
- The careers that define the 21st century require higher literacy competencies, including the ability to write effectively (*Murnane & Levy, 1997; Levine, 2007; U.S. Department of Labor, 2008*).

But Writing is Hard Work!



What are the Benefits?

- Writing supports conceptual development (*Rivard, 1994; Prain & Hand, 1996*).
- Students who write within a discipline are more familiar with the discourse of that discipline (e.g. *Keys, 2002*).
- Students develop skills that help them to better communicate their ideas (*Graham & Perin, 2007*).

Integrating Science and Writing

- Including a range of writing activities and writing instruction
 - makes writing a central part of thinking scientifically
 - communicates that writing is an authentic part of learning about science
 - demonstrates the ways that scientists share ideas

Writing Student Do Should Mirror the Writing Scientists Do

Students record observations	→	Scientists record as they observe and investigate
Students reflect on what they're learning	→	Scientists reflect to make sense of data
Students quickly write in preparation for sharing ideas	→	Scientists write to prepare for meetings and presentations
Students read and take notes	→	Scientists read and take notes about their findings
Students make explanations to make sense of 1 st hand and 2 nd hand evidence	→	Scientists make explanations that advance the field

Encourage writing for many different purposes and across multiple forms

- Writing to record
- Writing to brainstorm
- Writing to summarize
- Writing to reflect
- Writing in preparation for communicating orally



Writing to Record

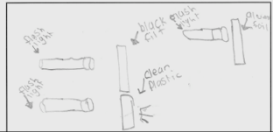
What Can You Observe About Light?

1. Shine the flashlight on your materials and observe what happens.
2. Record your observations with words or pictures.

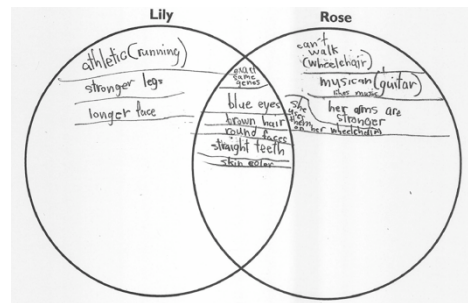
Observations:

You can see all the light through the clear plastic. You can only see a little light through the black felt. You can not see through the aluminum foil.

Make a drawing if it helps you explain. Label your drawing.



Writing to Brainstorm



Writing to Reflect

How is a moon like a planet?

The moon is like planet because the moon is like a planet is that the moon orbits the earth like all planets orbit the sun. Another reason the moon is like a planet is that the moon is a sphere. All planets are spheres too. The third reason the moon is like a planet is because the moon is light on one side and dark on the other side. All planets have this too.

Make a drawing if it helps you explain. Label your drawing.



Writing to Summarize

Summarizing

Tools that Bend Light, Part I

Step after you read each section of the book. Work with your partner to write a sentence or two about the section in the table below.

Heading	Main Idea Sentence(s)
Introduction	Refraction is when light bends.
magnifier	Magnifiers are to make small things look bigger.
telescope	To see things that are far away.
microscope	Microscope help small objects appear.
camera	The lens captures light and makes a picture.
human eye	Your eye has a lens that focuses light on the retina.
eyeglasses	They help you see things that are far away.

Writing in Preparation for Communicating Orally

Shared Discussion Notes: Mission to Oobleck

Circle the challenge for which you are the discussion leader:

1. The robot lander must be able to land safely on the surface of the planet. ✓
2. The robot lander must be able to travel to different parts of the planet.
3. The robot lander must be able to gather samples from Oobleck.
4. The robot lander must be able to communicate with scientists on Earth.

Notes from my group:

- #1 Big air bag all around rover made of rubbers
- #2 The rover has an antenna to communicate with earth.

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- Writing across different scientific genre

Genres of Science Writing

- Scientific Explanation
- Scientific Comparison
- Process Description
- Scientific Description
- Procedure
- Summary

Shared Attributes Common to All Forms of Scientific Writing

- An introduction
 - that presents the main idea or purpose of the piece
- Supporting details
 - that further explain the main idea
- Evidence is included
 - that comes from multiple sources
- Reasoning is often included
 - that tells why the evidence is included
- Transition words are used
 - to improve the flow of ideas
- A summary statement
 - wraps up the piece

Mentor Texts Can Be Used to Support Writing in Science

• A Mentor Text is...

- a published piece of writing whose **idea, structure, or written craft** can be used as a model or inspiration for writing.

Recipe for Plain Gelatin

What you need

- 1½ teaspoons of gelatin powder
- 1 cup of water
- 1 bowl that can go in the microwave
- spoon

What to do

- 1 Measure the ingredients.
- 2 Mix the gelatin powder with the water in the bowl.
- 3 Put the mixture in the microwave on high for 1 minute.
- 4 Carefully take the mixture out of the microwave.
- 5 Stir until all of the gelatin dissolves. (Careful, it may be hot.)
- 6 Chill the mixture for 4 hours.

What happens when you mix phenol red, water, and carbon dioxide?

Materials:

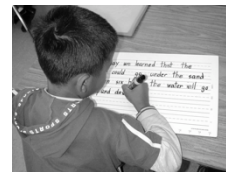
- ___ 50 ml water
- ___ pencil
- ___ 1 straw for each person
- ___ graduated cylinder
- ___ phenol red
- ___ carbon dioxide

Steps:

- 1) Measure 50 ml of water in graduated cylinder.
- 2) Pour the measured water into plastic cup.
- 3) Measure 5 ml of phenol red in graduated cylinder and pour it in the plastic cup.
- 4) Observe what happens based the observations of the mixture.
- 5) Use the straw to exhale into the liquid 12 times.
- 6) Record your observations.

Ways to Use Mentor Texts

- As a model
 - to show the structure of piece of writing
 - to highlight language structures
 - to show the kind of thinking that goes into scientific writing
- As a prompt
 - through the examination of photographs
 - through the examination of graphs, tables, charts, or diagrams
- As an opportunity for critique



Framework for Using Mentor Texts

- Introduce a specific genre of writing in a mentor text
 - discuss/list its characteristics
- Conduct a shared writing that follows the conventions of that genre
- Provide opportunities for students to practice writing in the genre,
 - add a new area of emphasis each time
 - list each characteristic discussed on a class chart
- Provide scaffolds
 - transition words
 - sentence starters
 - graphic organizers
- Have students evaluate their own writing with an eye toward the characteristics you've introduced

Break Outs

- Divide into three groups (groups will rotate)
 - ✓ Scientific Description Writing (Megan)
 - ✓ Scientific Comparison Writing (Jen)
 - ✓ Scientific Explanation Writing (Jill)
- Each presenter will
 - ✓ use a mentor text
 - ✓ share ideas for how to teach the characteristics of each genre

Themes Across Break Outs

- ✓ Mentor texts can be used in a variety of ways
 - Illustrating scientific language and word choice
 - Illustrating structure
 - Supporting critique
- ✓ Scientific Writing (in any genre) has common elements
 - An introduction
 - Supporting details
 - Evidence & Observation
 - Reasoning
 - Transition words
 - A summary statement

Themes Across Break Outs

- ✓ Science is a context for deep learning
 - Writing is a way to make sense of complex ideas
 - Pairing science "doing" with science reading and writing promotes understanding
 - Using evidence to support claims and ideas
- ✓ Scientific Writing (in any genre) is complex
 - Skills take time to develop and require modeling, discussion, and reflection
 - Working together on developing good habits around writing is key
 - Set high but realistic expectations – all students are good writers, some need more support than others
- ✓ Formative Assessment is an important part of writing instruction
 - Encourage re-reading & revising
 - Provide feedback (from peers & teacher)

Share Your Ideas

- ✓ Turn to a partner
 - How might you begin to implement what you learned today?
 - What questions do you still have?
- ✓ Share out
 - Implementation ideas
 - Questions

Practical Ways to Use Science As a Context for Improving Student Writing

For more information
seedsofscience.org OR scienceandliteracy.org
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