Learning Science through Narrative Nonfiction

EDC Learning transforms lives.

Making the Case for Reading in High School Science – in Learning

- Reading for comprehension is fundamental to both the doing of science and the learning of science.
- Both require the ability to derive meaning from scientific text, to evaluate the scientific validity of the information and to integrate related information from different sources
- The ability to read science-related text addresses one of the major goals of science education – a science literate citizenry

Making the Case for Reading in High School Science - Convergence

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

- Integrate and evaluate multiple sources of information in order to address a question or solve a problem.
- Evaluate the the information in a science or technical text, and validating with other sources of information.
- Synthesize information from a range of sources

Next Generation Science Standards (NGSS) Practices

8. Obtaining, evaluating, and communicating information

Making the Case for Reading in High School Science – The Data

Reading Between the Lines: What the ACT Reveals About College Readiness in Reading

The problem

- Only about half of our nation's ACT-tested high school students are ready for college-level reading.

- More students are on track to being ready for college-level reading in eighth and tenth grade than are actually ready by the time they reach twelfth grade.

- The clearest differentiator between students who are college ready and students who are not is the ability to comprehend complex texts

One recommendation

Strengthen reading instruction in all high school courses by incorporating complex reading materials into all course content.

The Challenges of Science Text at the Secondary Level

Reading of science text is often difficult for many students (and, speaking as a former research scientist, also for many scientists)

- Jargon/vocabulary often unfamiliar or differs in meaning from the vernacular
- Science text must be read to extract information accurately;
- Science texts are multimodal requiring integration of the written word, diagrams, chats, tables, equations, symbols etc.
- Often science text is mind-numbingly boring
- Supporting reading for comprehension may be difficult for secondary school teachers

Addressing the Challenge with Narrative Nonfiction

Narrative nonfiction has all the is a style of writing that has many of the same elements of a story or novel

- clear, well-developed characters
- story is told using scenes that follow a narrative arc
- an identifiable theme
- use of literacy devices such as imagery, symbolism, and metaphor
- Engaging and accessible but can still be complex
- Factual content must be accurate and verifiable

Narrative Nonfiction Can Be: Story

"Storytelling is not something we just happen to do. It is something we virtually have to do if we want to remember anything at all."

E.O. Wilson
The Power of Story American Educator , v26 n1 p8-11 (2002)

Stories can

- provide a framework to help organize and anchor concepts and content;
- engage both intellectually and emotionally, thus motivating students to learn the concepts involved in the story, and can create a desire to "dig deeper" into the ideas;
- can enhance assimilation of understandings into long term memory by association with the story

Narrative Nonfiction Can Be: Informational Text

Informational text can be written to provide content and conceptual coherency in a style that is accessible and engaging while retaining complexity and scientific accuracy and rigor

Using Narrative Nonfiction in the Classroom – An Example

Start with a Story

- Engage
- Show relevancy
- Pose a challenge
- Provide motivation

Informational Text

- Provide concepts and content to address the challenge
- Develop ability to extract relevant information

Application

- Deeper learning – transfer to a new situation

Simple Change, Unintended Consequences: Exploring Ecosystems

from Biology: Concepts and Practices

Goals for Student Understanding

- Ecosystems are interconnected by biological, physical, and chemical processes.
- Interactions among the biotic components and between the biotic and abiotic components define the features of an ecosystem.
- These interactions generate complex ecosystems that are stable over time but demonstrate cyclic fluctuations around equilibrium.
- Even simple changes in the ecosystem, whether natural or human-made, can cause major changes in the interactions in that ecosystem.

What's the Story?

Monsters of the Not So Deep—The Story of Lake Victoria

The story describes the ecology of Lake Victoria and the consequences to the lake as a result of the introduction of the Nile perch. This reading provides students with a vivid example of how a single change to an ecosystem can have dramatic and devastating consequences.

- Introduces concepts in ecosystems and the Law of Unintended Consequences
- Sets the stage for a challenge:

The Challenge

Students analyze a scenario in which an ecosystem is disturbed by an event. Students apply their understandings about the ecosystems to describe the impact of the change on the ecosystem and propose ways that the impact might be reversed.

Gathering and Synthesizing Information from Activities and Informational Text

ACTIVITY : Life Underfoot, Life Under Water

An exploratory investigation in which students analyze the biotic and abiotic components of a soil or water sample

READING: Living in the System

This reading provides information students need to address the challenge, including fundamental content about ecosystems and the interdependencies within them

Addressing the Challenge Applying Understandings

Scenario

- Mosquitoes: Can’t Live With ‘em, Can’t Live Without ‘em
- Invasion of the Night Crawlers
- Bright Lights, Night Lights (or Lightbulb, Mon Amour)
- Snakes on a Plane
- Stinging in the Rain
- Burning ‘Glades

Poster Demonstrating Synthesis and Communication

Students

- prepare a poster containing information about the change that occurred, the consequences of a single event , and suggestions for reversing the consequences
- view other groups' posters and take notes in preparation for a class discussion
- discuss own conclusions and solutions
- compare own ecosystem to others

.

Supports for Reading

Supporting reading for comprehension may be more difficult for secondary school teachers than elementary teachers who have expertise in teaching reading and writing

Recommendation in ACT college readiness report

Provide high school teachers with guidance and support to strengthen reading instruction

This can be done in preservice, inservice, and in educative curriculum that supports both teacher and student learning

Examples of Reading Strategies For Teachers

Teaching Strategies: Reading for Comprehension

For some students, this reading may be a review and reminder of many of the concepts they studied in middle school. For other students, the material may be new. Students are asked to Think About It within the reading. Inform them that this is a strategy designed to help them extract information by taking a breather and forming meaning of what they just read. Encourage them to write their responses and to jot down new vocabulary with their definitions in their notebooks. If you elect to have students read this in class, you may want to have a guided reading experience in which you have them stop after each paragraph and review the important points in what they have just read.

Examples of Reading Strategies For Teachers

Teaching Strategies: The Art and Skill of Skimming

The biographies of the scientists involve a great deal of reading, far too much for students to take in with a careful reading at this point. The goal of skimming the biographies is to see if anything jumps out at them as especially interesting. The skill of skimming a reading may be one students are not familiar with. When skimming, a reader looks for key words or phrases as their eyes pass over the page. Students may want to glance over the biographies and the science experiments, and if anything strikes them, go back and read that section more carefully before making choices about the scientist they may want to investigate further.

Example of Reading Strategies for Students

Student Note: *A word about words. Learning biology is, in part, about learning the language of biology. As you proceed through this course, you may feel somewhat overwhelmed by all the new vocabulary. A glossary is provided but you may want to create your own glossary in your notebook. As you come across new vocabulary, write the word in your glossary and the definition in your own words. These words are important because they will help you communicate ideas to your classmates and teacher. They might also help you see the world differently. For example, when you understand the meaning of the term biotic community, you may start to see more in a meadow, park, or tree trunk than you did before.*

Final Word(s)

In his essay “The Power of Story” E.O. Wilson proposes that science can be taught effectively through story. He states that the human brain functions by constructing narrative and that the presentation of complicated, essential science to a broad audience can be achieved through narrative and telling the science as a story.

He identifies the split between an educated person’s ability to understand science and the scientist’s ability to communicate scientific understandings in clear language as the “central challenge of education in the 21st century”. Narrative nonfiction in science writing and curriculum offers a powerful approach to bridging that split and educating students about the wonders of the natural world.