READING, WRITING, REASONING

Using science informational texts to achieve reading and writing standards

Kathy Agee
Science Program Coordinator
Good Morning!
Share with an elbow partner:

1. Why are you looking forward to at MSTA today?

1. What is your biggest challenge in your classroom with students’ reading or writing? *You are not allowed to say “Time”, because that is a given :(*
Why We Should Bring Nonfiction into the Early-Grade Classroom

By Nell K. Duke, V. Susan Bennett-Armistead, Ebony M. Roberts

Nell K. Duke, Ed.D. is a professor in literacy, language, and culture and also in the combined program in education and psychology at the University of Michigan. She has been named one of the most influential educational scholars in the United States. Check out Nell Duke’s YouTube video, “Speaking Up for Science and Social Studies”
At least three beliefs seem to underlie inattention to informational text in primary-grade or other early-childhood classrooms—that young children cannot handle informational text, that young children do not like informational text, and that young children should first learn to read and then (at about fourth grade) read to learn. In this [article] we demonstrate that none of these beliefs is supported by available research in this area.”
A study in first-grade classrooms in low-SES school districts indicates that there are benefits—even as early as the end of first grade—to including more informational text in classroom activities and the classroom environment. Children in classrooms with more informational text had the same levels of overall reading and writing achievement as children in comparison classrooms and were better writers of informational text. These students also did not show the decline in attitudes toward recreational reading that was found among students in the comparison classrooms. Moreover, children in the classrooms with more informational text who entered first grade with low sound-letter knowledge had higher reading comprehension and writing achievement by the end of first grade than comparable children in the other classrooms.”
Inside Information: Developing Powerful Readers and Writers of Informational Text Through Project-Based Instruction

Nell K. Duke
NSTA Position Statement

STEM Education Teaching and Learning
Declaration #2

High-quality K–12 STEM education is an essential, relevant, and continual endeavor for all students. STEM education

- enables analytical and critical thinkers;
- increases science, mathematics, and technology literacy;
- fosters the next generation of innovators and entrepreneurs;
- provides opportunities for students to engage in 21st-century skills of teamwork, collaboration, problem solving, communication, and creative thinking; and
- offers learning experiences in which students apply what they are learning in relevant, meaningful ways.
Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Chuek elli.stanford.edu

**Math**
- M1: Make sense of problems and persevere in solving them
- M2: Reason abstractly & quantitatively
- M6: Attend to precision
- M7: Look for & make use of structure
- M8: Look for & make use of regularity in repeated reasoning

**Science**
- S1: Ask questions and define problems
- S2: Develop & use models
- S5: Use mathematics & computational thinking
- S3: Plan & carry out investigations
- S4: Analyze & interpret data
- S6: Construct explanations & design solutions

**ELA**
- E1: Demonstrate independence in reading complex texts, and writing and speaking about them
- E2: Build a strong base of knowledge through content rich texts
- E3: Obtain, synthesize, and report findings clearly and effectively in response to task and purpose
- E4: Construct viable arguments and critique reasoning of others
- E5: Read, write, and speak grounded in evidence
- E6: Use technology & digital media strategically & capably
- E7: Come to understand other perspectives and cultures through reading, listening, and collaborations
- E8: Obtain, evaluate, & communicate information
### 3.3 Inheritance and Variation of Traits: Life Cycles and Traits

**Science and Engineering Practices**

**Developing and Using Models**

- Modeling is a K-2 experience and progresses to middle school and using models to represent events and design solutions.

**Analyzing and Interpreting Data**

- Analyzing data collected in K-2 experiences and progresses to introducing quantitative approaches to collect data and making predictions from data.

**Conducting Experiments and Engineering Solutions**

- Conducting experiments and designing solutions with the use of evidence in understanding explanations that support variables that disrupt and promote patterns and change the pattern in predicting solutions.

**Connecting to Nature of Science**

- Connections are based on recognizing patterns.

<table>
<thead>
<tr>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.1.5: Growth and Development of Organisms</strong></td>
<td><strong>Patterns</strong></td>
</tr>
</tbody>
</table>
| - Reproduction is essential to the continued existence of many types of organisms. Planes and animals have unique and diverse life cycles (3-5).
| - Inheritance of Traits |
| - Heritable characteristics of organisms are inherited from their parents. |
| - Other characteristics result from interactions with the environment, which can cause some traits to change. Many characteristics involve both inheritance and environment. (3-5).
| - Variations in Traits |
| - Differences are in how the traits look and function because they have different inherited information. |
| - The environment also affects the traits that are inherited. (3-5).
| - Natural Selection |
| - Sometimes the differences in characteristics between organisms of the same species provide advantages in surviving, finding mates, and reproducing. (3-5).

**Disciplinary Core Ideas**

- **Patterns**
  - Similarities and differences in patterns can be used to sort and classify natural phenomena (3-5).
  - Relationships can be used to make predictions (3-5).
- **Cause and Effect**
  - Cause and effect relationships are used to describe natural changes. (3-5).

**Crosscutting Concepts**

- **Science and Engineering Practices**
  - Models to describe phenomena.
  - Analyzing and interpreting data.
  - Conducting experiments and designing solutions.

**Connection to Nature of Science**

- Connections are based on recognizing patterns.
3. Inheritance and Variation of Traits: Life Cycles and Traits

Students who demonstrate understanding can:

3-LS1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]

3-LS3. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]

3-LS2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

3-LS4. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and thereby more likely to leave offspring.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education.
Common Core State Standards Connections:

**ELA/Literacy**

**RL.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**RL.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**RL.3.3** Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**RL.3.7** Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)

**W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant descriptive details, speaking clearly at an understandable pace. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**SL.3.5** Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)

**Mathematics**

**MP.2** Reason abstractly and quantitatively. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**MP.4** Model with mathematics. (3-LS3-1),(3-LS3-2),(3-LS4-2)

**3.NBT** Number and Operations in Base Ten (3-LS1-1)

**3.NF** Number and Operations—Fractions (3-LS1-1)

**3.MD.B.3** Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. (3-LS4-2)

**3.MD.B.4** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS3-1),(3-LS3-2)
Reading Comprehension
The procedure is actually quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you are pretty well set. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important but complications can easily arise. A mistake can be expensive as well. At first the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then one never can tell. After the procedure is completed one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.
Whether from a textbook or a nonfiction trade book, informational text can be the fuel that sparks curiosity about and interest in science, thus contributing to the development of scientific attitudes. As students read, they engage in processes common to science and literacy, such as predicting, generating questions, summarizing understandings, and using data to draw conclusions.”

*Primary Students & Informational Texts*
Hallie Kay Yopp and Ruth Helen Yopp
Science and Children magazine, November 2006
Preview - Predict - Confirm
Preview - Predict - Confirm

1. Preview the text and then close the book
Preview - Predict - Confirm

2. In groups of 3-5, students predict as many words as they can that the author might have used in the text. They then record their word predictions on cards - one word per card. They then group related cards. Each group then identifies a word they think every group recorded, a word they think may be unique to their group, and a word that interests them. Then the class discusses.
Preview - Predict - Confirm

3. Student read or listen to the selected text. As the text is read, the teacher and students note whether and how words are used in the book. After reading, they analyze their word choices and are provided the opportunity to add to their cards and to reorganize the words if they choose.
“Found Poems (after reading)
Found Poems (after reading text)

Found Poems are literally “found” in a text. Students creatively use the language of the author to construct a poem on the topic. After the teacher reads and discusses a text with students, students (working in pairs) return to the text to review and reflect on its content and language. They search the text for words and phrases that capture key concepts and use these words and phrases to create an original free-verse poem. Each pair of students records all words and phrases of their choice on small strips of paper. Students then manipulate the strips to form a poem, ordering and reordering the words and phrases as desired. (Words can be eliminated, and others added by going back to the text. Words or phrases may be repeated for emphasis.) The teacher circulates and informally interviews to check for understanding. When the poem is finished, students copy it to a piece of paper and add illustrations and then share them with the class.
"Found poems" by three pairs of first graders

<table>
<thead>
<tr>
<th>Rocks</th>
<th>People collect all kinds of things.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millions and millions of years old</td>
<td>Rocks</td>
</tr>
<tr>
<td>You live on rock</td>
<td>Rocks are easy to find.</td>
</tr>
<tr>
<td>The earth’s crust</td>
<td>Sand was blown into rivers.</td>
</tr>
<tr>
<td>Igneous</td>
<td>Crystals</td>
</tr>
<tr>
<td>Sedimentary</td>
<td>Marbles</td>
</tr>
<tr>
<td>Metamorphic</td>
<td>Shells of animals</td>
</tr>
<tr>
<td>Rocks last and last</td>
<td>Cement</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard rocks</td>
<td></td>
</tr>
<tr>
<td>Soft rocks</td>
<td></td>
</tr>
<tr>
<td>1 to 10</td>
<td></td>
</tr>
<tr>
<td>Sand, mud, pebbles</td>
<td></td>
</tr>
<tr>
<td>Sand, mud, pebbles</td>
<td></td>
</tr>
<tr>
<td>Sedimentary rock forming</td>
<td></td>
</tr>
</tbody>
</table>
Formative assessment can uncover children’s science misconceptions.
Writing Across the Curriculum

Click to find:

English
Language Arts
Social Studies
Science
The Arts
Mathematics
## The Water Cycle

<table>
<thead>
<tr>
<th>Role</th>
<th>Audience</th>
<th>Format</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water molecule</td>
<td>Self</td>
<td>Diary Entry</td>
<td>What happens to you in each stage of your life</td>
</tr>
<tr>
<td>Scientist</td>
<td>5th Graders</td>
<td>Presentation or Speech</td>
<td>How the Water Cycle Works</td>
</tr>
<tr>
<td>5th Grader</td>
<td>Parents or Younger sibling</td>
<td>Letter</td>
<td>What I have learned about the Water Cycle</td>
</tr>
<tr>
<td>Actor/Actress</td>
<td>Audience</td>
<td>Skit</td>
<td>The _______ life of a molecule</td>
</tr>
<tr>
<td>Detective</td>
<td>Mystery Story Reader</td>
<td>Mystery Story</td>
<td>The Curious Case of the Water Molecule</td>
</tr>
</tbody>
</table>

Created by: Mike Maxwell
Anyone connected to GVSU can check out materials. Anyone in the state of Michigan, who has a library card, can check out materials. Books and Periodicals can be sent to your local public library. Puppets and teaching materials must be picked up in person.

gvsu.edu/library/cml
mel.org/educators
3D Augmented Reality Coloring App
Thank you!

Kathy Agee
Science Program Coordinator
ageek@gvsu.edu
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Blow your audience away with attractive visuals