

# Implications for Science Education: HB 930/SB 306

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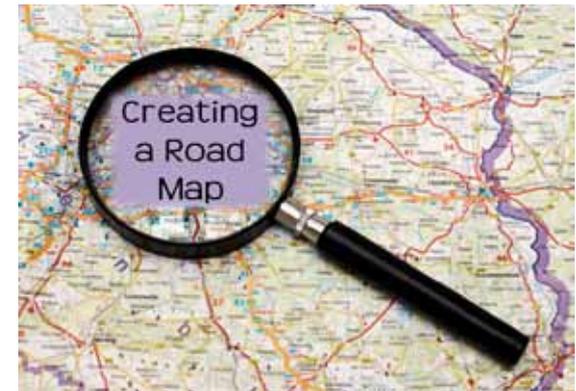
**President Elect**

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# Roadmap for Success

- **Principles to Consider**
- **What We've Been Aiming for**
- **Where We Are Today**
- **Interpreting HB930/SB306**
- **Recommended Guidelines**
- **What Teachers and Schools Need**



# Principle 1: Curriculum, Assessment, and Instruction are Inseparable

- Teachers can narrow their focus to the standards that are tested rather than the entire set of learning outcomes of a course, thereby changing the breadth and depth of coverage
  - Garris and Grant, 2008, p. 13)



# Principle 2: Assessment *For* and *Of* Learning

Autopsies do not  
make better  
patients.

Doug Reeves (2000)



# Principle 3: Science Education is an Ecosystem

— **Assessment must ask students to apply their learning to situations that are quite similar to instruction as well as those that are new.**

**Abell & Volkman (2006)**



# What We've Been Aiming For

- ***Doing*** and ***knowing*** science on equal footing
- ***Investigate and understand***
- ***Doing*** science, the verb, and ***knowing*** science, the cognitive outcomes



# What We've Been Aiming For

- Every science concept and skill **builds** on previously introduced concepts and skills.
- Concepts and skills progress in **complexity and scope** from Kindergarten to high school Physics.
- A solid foundation in the elementary grades is **required** for success in middle and high school.



# Where We Are Today!

- **Fordham Foundation – Virginia’s Standards**
- **National Assessment of Educational Progress (NAEP) -4<sup>th</sup> Grade**
- **Trends in Mathematics and Science Study (TIMSS) Linking Study – 8<sup>th</sup> Grade Science**
- **Advanced Placement (AP) Science – High School**



# A Tale of Two Science Classrooms

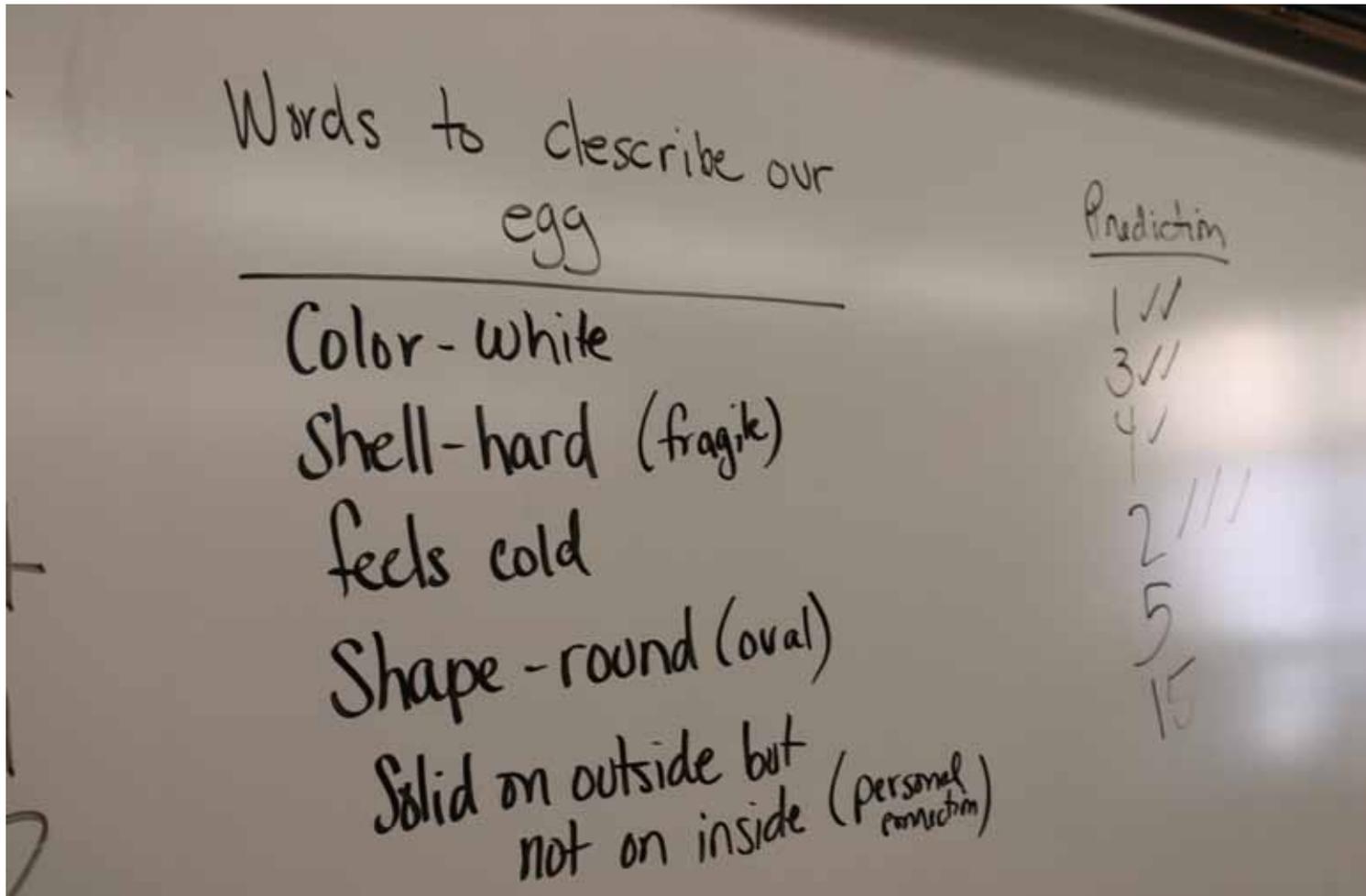
*Inquiry in Action*



# Big Idea: Culture has made the impossible possible



# Descriptive Writing/Developing Language



# Inquiry: Developing a Simple Testable Question

Question

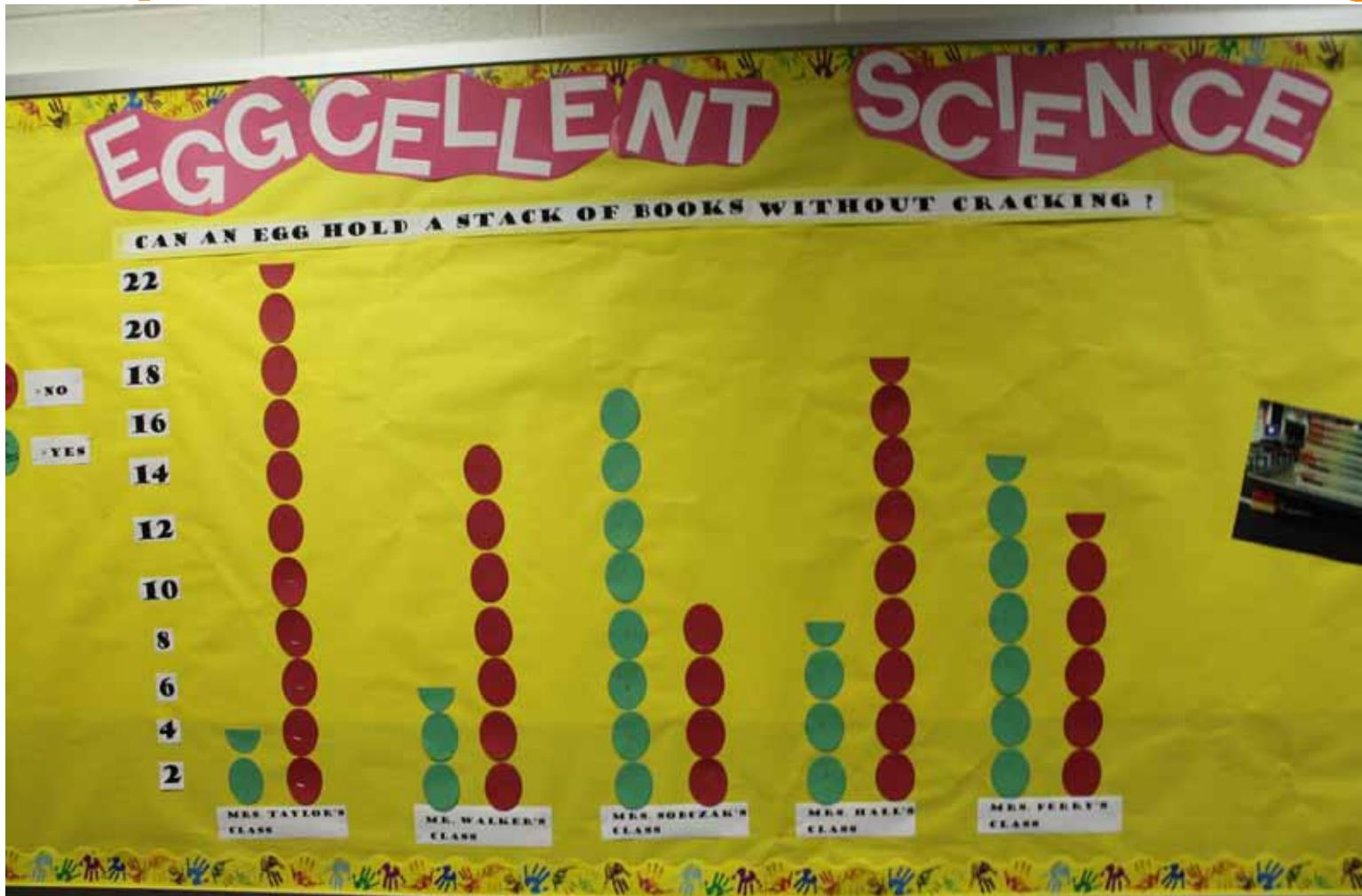
Does changing the position of an egg (from side to top) make a difference on # of books it can hold.

# Expository Writing: Compare/Contrast

## Egg 1 and Egg 2



# Math-Creating Graphs to Represent Information Visually



# Math-Relevant Use of Statistical Terms

**Mrs. Hall's Class Predictions**

On the side		On the tip	
Mean	3.25	Mean	1.3
Median	2	Median	0
Mode	0, 2	Mode	0
Range	15	Range	6

**Actual Results from Book Stacking Experiment**

On the side	On the tip
5	6

# Egg-citing Learning

<b>Science</b>	<b>Math</b>	<b>Social Studies</b>	<b>Language Arts</b>
<p>SOL 3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations</p> <p>SOL 3.3 The student will investigate and understand that objects are made of materials that can be described by their physical properties</p>	<p>3.17 The student will</p> <p>a) collect and organize data, using observations, measurements, surveys, or experiments;</p> <p>b) construct a line plot, a picture graph, or a bar graph to represent the data; and</p> <p>c) read and interpret the data represented in line plots, bar graphs, and picture graphs and write a sentence analyzing the data.</p>	<p>SOL 3.1 The student will explain how the contributions of ancient Greece and Rome have influenced the present world in terms of architecture, government (direct and representative democracy), and sports.</p>	<p>3.1 The student will use effective communication skills in group activities.</p> <p>3.4 The student will expand vocabulary when reading.</p> <p>3.6 The student will continue to read and demonstrate comprehension of nonfiction texts.</p> <p>3.9 The student will write for a variety of purposes.</p>

# Interpreting HB930/SB306

- 1. School division will develop and administer science alternate assessments for each Grade Three student.**

“Each school board shall annually certify that it has provided instruction and administered an alternative assessment, consistent with Board guidelines, to students in grades three through eight in each Standards of Learning subject area in which a Standards of Learning assessment was not administered during the school year.  
(22.1-253.13:3 Standard 3, Section C, Paragraph 6)



# Interpreting HB930/SB306

2. **Grade Three science alternate assessments will provide a) detailed student proficiency information, and b) summative composite measures that can be aggregated.**

“To assess the educational progress of students as **individuals** and as **groups**, each local school board shall require the use of Standards of Learning assessments, *alternative assessments*, and other relevant data, ... to evaluate student progress and to determine educational performance.”

(22.1-253.13:3 Standard 3, Section F, Paragraph 1)



# Interpreting HB930/SB306

## 3. School division will report school-level data about student mastery of the standards assessed by the alternate assessments.

“The Board shall include in the student outcome measures that are required by the Standards for Accreditation end-of-course or end-of-grade- *assessments* for various grade levels and classes, *including the completion of the alternative assessments implemented by each local school board*, in accordance with the Standards of Learning.”

(22.1-253.13:3 Standard 3, Section C, Paragraph 4)



# Guideline Area I: High-Quality Science Curriculum and Instruction

Grade Three alternative science assessments **must**:

1. provide measures for **all** Grade Three science standards;
2. use and apply science **skills** and **knowledge** combined;
3. be presented in the context of **investigative and problem-solving tasks**;
4. represent **realistic** and **novel** situations, not repeating prior performances; and
5. reflect student growth over time versus a single event test.



# Guideline Area II: High-Quality Assessment

**Grade Three alternative science assessments must be:**

- 1. clear and understandable;**
- 2. consistent with the division curriculum/instructional program;**
- 3. economical in terms of the additional time required for teachers;**
- 4. reliable and valid for the purposes of measuring primary-grades science achievement; and**
- 5. constructed so that achievement measures can be aggregated.**



# Expert Learning for Assessment in Science

<b>Principles of Expertise</b>	<b>Evidence for Learning</b>	<b>Sample Assessment Item</b>
Experts organize and communicate their knowledge.	Students' ability to structure knowledge and see relationships among concepts/ideas.	<p>You have been asked to write an article for the PTA newsletter that describes the results of your egg experiment. To complete your article, you will need to do the following steps:</p> <ul style="list-style-type: none"><li>• Describe the physical properties of the egg;</li><li>• Use a Box and T Chart to compare and contrast both eggs (before and after the books were placed on them);</li><li>• Use evidence from the experiment and what you know about arches to help explain the results.</li></ul>



\*\* After unit on Grade 3 SOL Standard 3.3

# Guideline Area III : Effective and Efficient Reporting

**Reporting Grade-Three science achievement should be in a **format** that:**

- 1. is consistent and comparable as an achievement measure among schools and divisions (e. g., a sample four-point reporting rubric);**
- 2. is prepared with minimal expenditure of time by teachers and school personnel; and**
- 3. is readily understood by parents and the public both in group measures and individual student-level information.**



# Rubric

	<b>Expert</b>	<b>Practitioner</b>	<b>Apprentice</b>	<b>Novice</b>
<b>Science Concepts</b>	Article describes the activity and experiment in detail using correct scientific terms; physical properties are used to describe how the structure of the egg (arch) impacted the results.	Article describes the activity and experiment in detail using correct scientific terms; physical properties are used to describe how the egg impacted the results but the connection to significance of the arch structure is not clearly stated but rather inferred.	Article describes the activity and experiment in a narrative but leaves out key scientific terms or the terms are not clearly defined. Use of physical properties is only in the description of the egg and does not clearly articulate the significance of arches.	Article describes the activity and experiment. Scientific terms are left out or are incorrectly used. Use of physical properties is only in the description of the egg. No connection to significance of the arch structure is made.



Grade Level : <u>3</u> Type of Writing General	COMPOSING
<p style="text-align: center;"><b>4</b> (Exceeds Expectations)</p>	<ul style="list-style-type: none"> <li>• selects and narrows a topic</li> <li>• focuses on a topic</li> <li>• organizes ideas in a logical way</li> <li>• uses figurative language (similes and metaphors) effectively</li> <li>• elaborates with details using examples, reasons, and events</li> <li>• contains a creative opening and closing</li> <li>• uses transitional words and phrases appropriately</li> </ul>
<p style="text-align: center;"><b>3</b> (Meets Expectations)</p>	<ul style="list-style-type: none"> <li>• selects and narrows a topic</li> <li>• focuses on the topic</li> <li>• includes few lapses in organization</li> <li>• contains an effective opening and closing</li> <li>• uses adequate supporting details</li> <li>• uses some transitional words and phrases</li> </ul>
<p style="text-align: center;"><b>2</b> (Demonstrates Minimal Competency)</p>	<ul style="list-style-type: none"> <li>• selects a topic, but has difficulty narrowing a topic</li> <li>• focuses on the topic most of the time, but includes some unrelated ideas</li> <li>• uses an organizational pattern containing frequent lapses</li> <li>• contains an underdeveloped opening and/or closing</li> <li>• lacks sufficient details</li> <li>• uses few transitional words or phrases</li> </ul>
<p style="text-align: center;"><b>1</b> (Does not Meet Expectations)</p>	<ul style="list-style-type: none"> <li>• has difficulty selecting and narrowing a topic</li> <li>• strays from the topic most of the time</li> <li>• has little or no organization</li> <li>• contains an ineffective opening and/or closing or none at all</li> <li>• includes little or no details</li> <li>• does not use transitional words or phrases</li> </ul>

# Questions/Thoughts to Consider



# What Teachers and Schools Need

- **Time**
  - **Time for Implementation**
  - **Time for Teaching of Science**
- **Examples of Assessments**
  - **Define positive and negative examples for purpose of legislation**
- **Professional Development**
- **Financial Resources**
- **Validity and Reliability**



# Leading for the Future

- **Partnerships**
  - **VAST, VA ASCD, VMSC, VSELA**



