Science Academies

South Dakota Science and Literacy

Sam Shaw
South Dakota in Context

- About 126,128 public school students
  - US Average is 970,278 (more than our state population)
- 156 School Districts
- Served by 9,511 public school teachers
- 875 MS/HS teachers with science assignments
Current Initiatives

• Part 1: Science Academies
  – First step in implementing vision from *the Framework*

• Part 2: CCSS for Literacy in Science Trainings
  – Supplemental trainings for teachers to be explicit about reading strategies

• Part 3: Next Steps
South Dakota Science Academies

• Governor Dennis Daugaard’s Investing in Teachers Package

• To create a shift in instructional practice to challenge students to higher levels of understanding and performance.
  – Higher-order thinking
  – Student performance
“an important role of science education is not to teach ‘all the facts’ but rather prepare students with sufficient core knowledge so that they can later acquire additional information on their own.” - Framework for K-12 Science Education
Practice #8

• Obtaining, Evaluating and Communicating Information
  – Information can be obtained by many ways including listening, reading, viewing, and investigating.
  – This Practice is used by students every day!
    • Although, how often are students ONLY obtaining?
      – Study with High School teacher-trainers.
Practical Sequence

Gather
- Obtain Information
- Ask Questions/Define Problems
- Plan & Carry Out Investigations
- *Use Models to Gather Data*
- Use Mathematics & Computational Thinking

Reason
- Evaluate Information
- Analyze Data
- Use Mathematics and Computational Thinking
- Develop Arguments from Evidence
- Construct Explanations/Solve Problems
- *Use Models to Predict & Develop Evidence*

Communicate
- Communicate Information
- Argue from Evidence (written & oral)
- *Use Models to Communicate*
Science Academies

• Based on components of the *Framework* and the shifts from the NGSS

• Central ideas:
  – Student performance
  – Constructing explanations from evidence

• Built to initiate a vision for science education in South Dakota

• Two-day training
Science Academies Structure

• Scaffold the 3-dimensions from the Framework

• Engage participants as if they were students
  – Modeling appropriate instructional strategies

• Each performance follows the Gather, Reason, Communicate (GRC) sequence

• “Make thinking visible” through adding communication expectations to performances
  – E.g. Writing, speaking, visual modeling
Science Academies

- 2012: 22 teachers trained
- 2013: ~400 6-12 teachers
- 2014: Available for 1,120 K-5 teachers
- High demand for repeat trainings for 6-12

Future focus is on lesson analysis and development using GRC Model

- Evaluation: Qualitative Surveys
- Informal Evaluation – Trainers were required to analyze teachers comfort level with the NGSS shifts. (Human Graph)
#1 Lesson Learned from round 1

• Being a science facilitator is a skill
  – The ability to listen to gather, reason and communicate throughout a training
  – Our trainers have obtained a science education that favors content over practice

• You CANNOT overestimate the amount of time it will take to prepare quality facilitators.
# Part 2: CCSS for Literacy in Science

## Reading Standards for Literacy in Science and Technical Subjects 6-12

### Key Ideas and Details

<table>
<thead>
<tr>
<th>Grades 6-8 students:</th>
<th>Grades 9-10 students:</th>
<th>Grades 11-12 students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cite specific textual evidence to support analysis of science and technical texts.</td>
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<td>1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.</td>
<td>2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</td>
<td>2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
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<tr>
<td>3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</td>
<td>3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</td>
<td>3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
</tbody>
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### Craft and Structure

| 4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. | 4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. | 4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. |
| 5. Analyze the structure an author uses to organize a text, including how the sections contribute to the whole and to an understanding of the text. | 5. Analyze the structure of the relationships among key terms (e.g., force, friction, reaction force, energy). | 5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. |
| 6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. | 6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. | 6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. |

### Integration of Knowledge and Ideas

| 7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). | 7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. | 7. Integrate and evaluate multiple sources of information presented in diverse forms and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| 8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. | 8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. | 8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. |
| 9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. | 9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. | 9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. |

### Range of Reading and Level of Text Complexity

| 10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. | 10. By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. | 10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently. |

<table>
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<th>Obtain Information</th>
<th>Gather</th>
<th>Input: Reading, Listening</th>
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<tbody>
<tr>
<td>Evaluate Information</td>
<td>Reason</td>
<td>Processing</td>
</tr>
<tr>
<td>Communicate Information</td>
<td>Communicate</td>
<td>Output: Writing, Speaking,</td>
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Practice #8 and Literacy in ELA
CCSS for Literacy in Science

• One day training in the “shifts” as described by Student Achievement Partners.
• Strategies are aligned and practiced, by shift.
• Online PLC follow-up to engage in lesson modification, implementation and reflection
• Currently working on developing a Literacy Design Collaborative extension to this training to utilize LDC’s modules for Science.
  – This may require some language change to align to the Framework for K-12 Science Education
CCSS for Literacy in Science

1. Building knowledge through **content-rich nonfiction**
   - **Close Reading**

2. Reading, writing and speaking **grounded in evidence** from text, both literary and informational
   - **Text-Dependent Questions**

3. Regular practice with **complex text** and its **academic language**
   - **Text Structures**

Achievethecore.org
CCSS for Literacy in Science

• Participants are asked to bring one lesson and one text that goes along with the lesson.
  – Guess what they brought

• Does the text alone allow students to engage in multiple Scientific and Engineering Practices to help students construct explanations from evidence?
  – If not, how can we get students to engage in the information?
3-2-1 Visual Literacy

• Science, Technical Subjects
• Examine the picture or item (Science)
• On an index card or sticky note (or in a journal)
  – List 3 things you observe
  – List 2 things you can claim with supporting evidence and reasoning
  – List 1 thing you want to explore further to gather more evidence to prove your claim

• Conduct a group “share”
• How does this fit with content rich informational text? With using evidence to support statements?
Visual Thinking

3 = Observe
2 = Claim
1 = Explore

http://goo.gl/nmKD0t
Close-Reading

Begin with the TEXT.

http://iteachicoachiblog.blogspot.com/2012/06/five-simple-close-reading-strategies.html
Webb’s Leveling is what is used for Common Core in South Dakota. This needs to be compared with the practices in Science to help teachers transition.
Part 3: Next Steps

• Review NGSS and make a recommendation to the SD Board of Education
  – projected adoption of South Dakota Science Standards in early 2015

• Continue implementation of the Framework to create seamless transition to standards implementation.
  – 2 year implementation plan in development

• Offer supporting Common Core trainings for reading/listening and writing/speaking in Science

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