Next Generation Science Standards and the Common Core

Susan Pimentel

Why include literacy for science in the Common Core?

- To encourage (ensure) science study in the early grades.
- To ensure students are taught how to handle science texts so by high school they are able to access science information through texts (many high school teachers report they avoid texts in class)
- To ensure students can handle science texts so they don't face limitations upon graduation (< 50% of students can handle reading assignments in freshmen courses).
- To prepare students for citizenship (in addition to college and careers).
- NGSS effort was not yet underway!

Key Principle

*The Common Core's literacy for science standards are meant to support **not** supplant a state's science standards—they are meant to buttress the teaching and learning of science content.*

Who is responsible for what?

- K-5 teachers are responsible for applying the ELA/literacy Common Core standards when studying literature, history/social studies, science, and the like.
- In grades 6-12, there are three sets of Common Core standards:
  - ELA teachers are responsible for the ELA standards
  - Science teachers are responsible for the literacy standards for science (in conjunction w/state science content standards)
  - History/social studies teachers are responsible for the literacy standards for history/social studies (in conjunction w/state history/social studies content standards)

Literacy for Science (Shanahans)

- As the CCSS affirms, reading in science requires an appreciation of the norms and conventions of the discipline of science, including
  - the nature of evidence and attention to precision and detail in what is often technical, abstract, dense, and tightly knit language
  - the gathering, synthesis (and corroboration) of complex information
  - the capacity to make and assess intricate arguments
  - the ability to follow detailed procedures and make accounts of events and concepts
  - the close connections among prose, graphs, charts, formulas
- Likewise, writing and presenting information orally are key means for students to assert and defend claims in science, demonstrate what they know about a concept, and convey what they have experienced, imagined, thought, and learned.

Using Textual Evidence and Attending to Detail (Science & Engineering Practice 6: Constructing Explanations and Designing Solutions)

- Grades 6-8: Cite specific textual evidence to support analysis of science and technical texts.
- Grades 9-10: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- Grades 11-12: 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.

Gathering Relevant Evidence (Science & Engineering Practice 8: Obtaining, Evaluating, and Communicating Information)

- Grades 6–8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

- Grades 9–10: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

- Grades 11–12: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Synthesizing Complex Information

(Science & Engineering Practice 6: Constructing Explanations and Designing Solutions)

- Grades 6–8: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- Grades 9–10: 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.
- Grades 11–12: 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.

Making Arguments (Science & Engineering Practice 7: Engaging in Argument from Evidence)

- Grades 6–8: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- Grades 9–10: Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Grades 11–12: Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

Assessing Arguments (Science & Engineering Practice 7: Engaging in Argument from Evidence)

- Grades 6–8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- Grades 9–10: 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.
- Grades 11–12: 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.

Following Complex Processes & Procedures (Science & Engineering Practice 3: Planning and Carrying Out Investigations)

- Grades 6–8: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- Grades 9–10: 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.
- Grades 11–12: 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.

Conducting Research (Science & Engineering Practice 3: Planning and Carrying Out Investigations)

- Grades 6–8: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- Grades 9–10: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- Grades 11–12: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Translating Information from One Form to Another (Science & Engineering Practice 8: Obtaining, Evaluating, and Communicating Information)

- Grades 6–8: 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).
- Grades 9–10: 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.
- Grades 11–12: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Explaining concepts, processes and procedures (Science & Engineering Practice 6: Constructing Explanations and Designing Solutions)

- Grades 6–8: Write informative/explanatory texts, including the narration of *scientific procedures/experiments or technical processes*. . . Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

- Grades 9–10: Write informative/explanatory texts, including the narration of *scientific procedures/experiments or technical processes*. . . Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

- Grades 11–12: Write informative/explanatory texts, including the narration of *scientific procedures/experiments or technical processes*. . . Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Key Principle

*The Common Core's literacy for science standards are meant to support **not** supplant the NGSS Science and Engineering Practices—they are meant to buttress the teaching and learning of science content.*