SCHEMA FOR LDC WORK IN SCIENCE & TECHNICAL SUBJECTS | DRAFT OF MAY 1, 2015

CHALLENGE
How can members of the Literacy Design Collaborative build out tasks and modules that:
- Call for rigorous work in life sciences, physical sciences, earth & space sciences, and engineering?
- Prompt robust development in the scientific practices specified by the Next Generation Science Standards (NGSS)?
- Develop the distinctive literacy skills used in the sciences?
- Prepare students to use scientific knowledge and skills to make individual choices and contribute to social decisions?

POSSIBLE STEPS TOWARD TASK-LEVEL SOLUTIONS
LDC can:
1. Create a typology of writing prompts that uses NGSS practices to add specificity to the Common Core State Standards (CCSS) expectations for argumentation and information/explanation.
2. Identify juried tasks that fit that typology and engage physical sciences, life science, and earth and space sciences (with engineering embedded in tasks that design solutions using those sciences).
3. Look for opportunities to add tasks that fill out the writing typology for each type of science, with elementary, middle and, and high school versions.
4. Also seek feedback from varied LDC users to clarify and improve the schema over multiple iterations.

The pages that follow share a possible typology, includes tentative entries of existing good-to-go and exemplary tasks, and offers a few ideas (in bracketed italics) of additional tasks that might fill additional cells of the typology.

NGSS SCIENTIFIC PRACTICES

1 Asking Questions and Defining Problems

2 Developing and Using Models

3 Planning and Carrying Out Investigations

4 Analyzing and Interpreting Data

5 Using Mathematics and Computational Thinking

6 Constructing Explanations and Designing Solutions

7 Engaging in Argument from Evidence

8 Obtaining, Evaluating, and Communicating Information

A NOTE ON SPECIALIZED TEXTS FOR SCIENCE & TECHNICAL SUBJECTS
The schema that follows identifies three specialized types of texts.

CCSS Reading Standard 6 calls for students to Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words," and the schema's use of "visual sources" and "data displays" offers a way to identify tasks that provide specific opportunity to build that type of literacy.

"Research sources" include other texts students must engage as they "conduct short as well as more sustained research projects based on focused questions" and "gather

relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism." That is, they are the additional readings called for by CCSS Writing Standards 6 and 7.

ELEMENTARY SCHEMA FOR LDC WORK ON SCIENCE AND TECHNICAL SUBJECTS

Possible goal: Modules for every prompt type, with some entries in each discipline column and some entries for each specialized text type.

PROMPT TYPE	MODULE TITLE	DISCIPLINES			SPECIALIZED TEXT TYPES		
		Physical Science	Life Science	Earth & Space Science	Visual Sources	Data Displays	Research Sources
Explain the investigations, evidence, and reasoning that support a scientific discovery							
Explain the design process that solved a practical problem							
Compare older and newer models, explaining how both account for some observed phenomena but the newer model is stronger							
Explain how new data demonstrates or clarifies a existing scientific concept or design solution							
Design an investigation to answer a question							
Gather data, analyze it, and discuss how it contributes to answering a question							
Define a problem, including solution criteria and constraints							
Test a potential solution and report on how well it meets criteria and fits constraints							
Compare competing explanations and evaluate how well they fit available data							
Define a problem and evaluate competing solutions							
Evaluate the problems created by a possible solution	Fast Food: Friend or Foe		X				
	Should Animals Be Kept in Zoos?		X				

MIDDLE SCHOOL SCHEMA FOR LDC WORK ON SCIENCE AND TECHNICAL SUBJECTS

Possible goal: Modules for every prompt type, with some entries in each discipline column and some entries for each specialized text type.

PROMPT TYPE	MODULE TITLE	DISCIPLINES			SPECIALIZED TEXT TYPES		
		Physical Science	Life Science	Earth & Space Science	Visual Sources	Data Displays	Research Sources
Explain the investigations, evidence, and reasoning that support a scientific discovery	Mitochondria/Aging		X				
	Voyager I			X			
	Noise Pollution	X	X				
Explain the design process that solved a practical problem	Atomic Fission/Atomic Bomb*	X			X		X
Compare older and newer models, explaining how both account for some observed phenomena but the newer model is stronger							
Explain how new data demonstrates or clarifies a existing scientific concept or design solution	Sports, Forces, and Newton's Laws	X			X		X
	Photosynthesis and Laws of Conservation	X	X				
Design an investigation to answer a question	Effect of Algal Blooms		X			X	
Gather data, analyze it, and discuss how it contributes to answering a question	Effect of Algal Blooms		X			X	
Define a problem, including solution criteria and constraints							
Test a potential solution and report on how well it meets criteria and fits constraints							
Compare competing explanations and evaluate how well they fit available data							
Define a problem and evaluate competing solutions	Fuel For Examination	X	X				
Evaluate the problems created by a possible solution	Cryobiology	X	X				
	Does the DDT Ban have Merit?		X				
	Pesticides: Blessing, Curse, or Both		X				

* Exemplary module not yet in CoreTools

HIGH SCHOOL SCHEMA FOR LDC WORK ON SCIENCE AND TECHNICAL SUBJECTS

Possible goal: Modules for every prompt type, with some entries in each discipline column and some entries for each specialized text type.

PROMPT TYPE	MODULE TITLE	DISCIPLINES			SPECIALIZED TEXT TYPES		
		Physical Science	Life Science	Earth & Space Science	Visual Sources	Data Displays	Research Sources
Explain the investigations, evidence, and reasoning that support a scientific discovery	Mitochondria/Aging		X				
	Radioactivity/Elements	X					
Explain the design process that solved a practical problem							
Compare older and newer models, explaining how both account for some observed phenomena but the newer model is stronger							
Explain how new data demonstrates or clarifies a existing scientific concept or design solution	Sports, Forces, and Newton's Laws	X			X		X
Design an investigation to answer a question							
Gather data, analyze it, and discuss how it contributes to answering a question	Fire Down Below (Antacids)	X				X	
Define a problem, including solution criteria and constraints	Building Bridges	X			X	X	
Test a potential solution and report on how well it meets criteria and fits constraints	Building Bridges	X			X	X	
Compare competing explanations and evaluate how well they fit available data							
Define a problem and evaluate competing solutions	Chemistry Behind Electricity Generation	X					
	Force and Motion (Cars)	X					
	Fuel For Examination	X	X				
	Marine Ecosystems		X				
	Nuclear Sustainability	X					
	Pandemic**						
	Silent Spring*	X	X				
Evaluate the problems created by a possible solution	Cryobiology	X	X				
	Does the DDT Ban have Merit?		X				

Not included:

- Blood Disorders [scientific implications for authentic audience)
- Engineering Disciplines (orientation to a life of applying engineering)
- Life Stages in Health Care [scientific implications for authentic audience)

* Exemplary module not yet in CoreTools

** Listed in CoreTools as ELA but engaging a clearly scientific question