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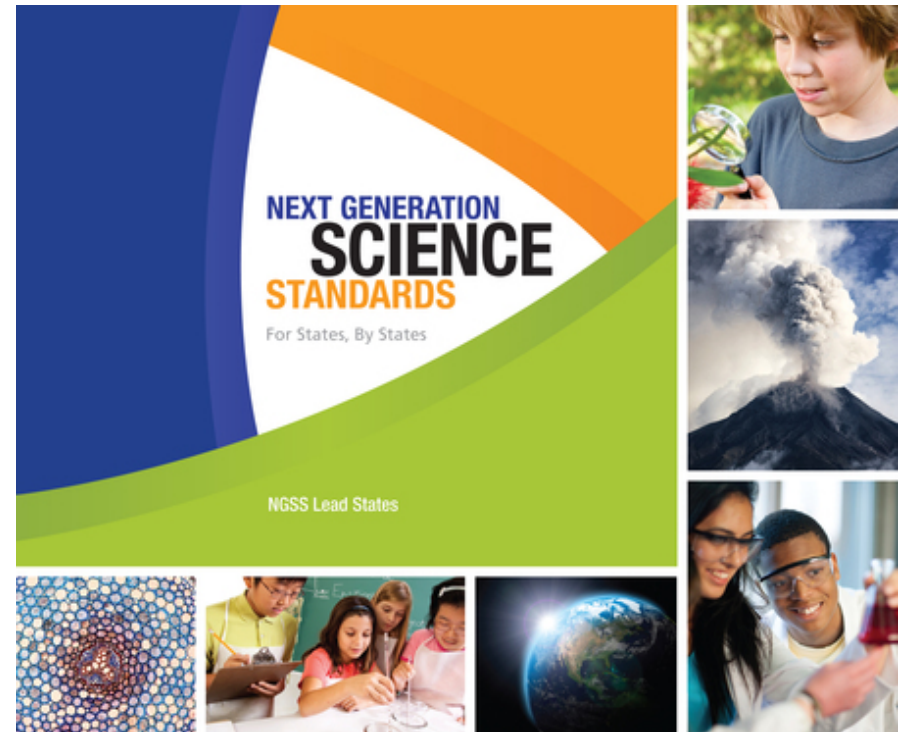
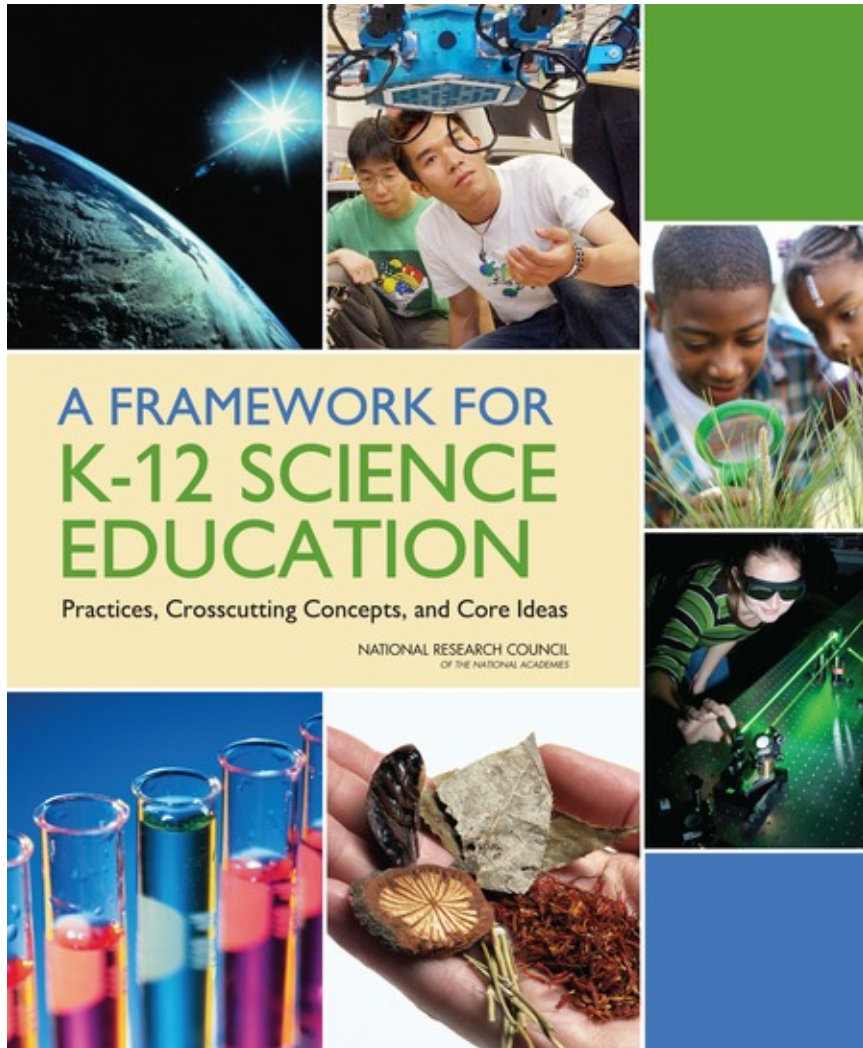
Making Computer Science a First-Class Object in the K-12 Next Generation Science Standards

SIGCSE 2015 Lightning Talk

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What Are the NGSS?

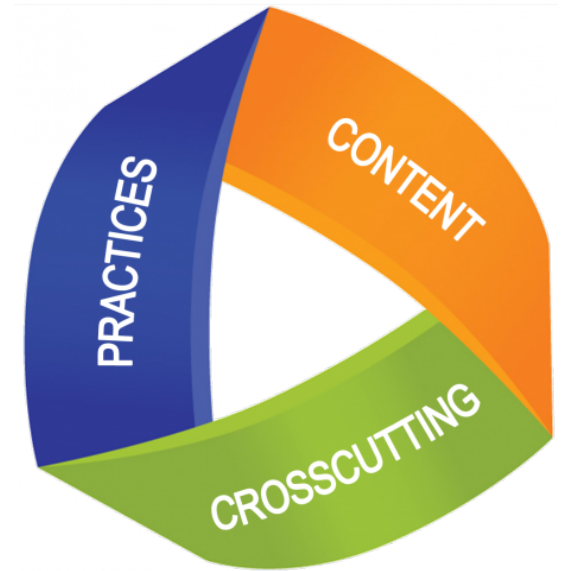
Two Parts: The 2012 Framework...



and the Next Generation Science Standards: For States, By States (2013)

And Why Should We Care?

- Response to “mile wide, inch deep”
 - What “literate citizens” are expected to know
 - Developed with input from states (though state adoption is lagging)
- Terminology
 - **Disciplinary Core Ideas** (domain ideas or principles around which experts organize their knowledge), **Cross-cutting Concepts**, and **Practices** in Science (Inquiry) and Engineering (Design).





Where is Computer Science in the NGSS?

An allied subject, like psychology or economics

Why?

“K-12 teachers are afraid of computer science, unlike engineering. Everyone’s put together a table from IKEA.”

-- Google Education Staffer

Design and Cross-cutting Practices for CS/CT

- Analyze the effects of developments in computing.
- Design and implement creative solutions and artifacts
- Apply abstractions and models.
- Analyze computational work of self and others
- Communicate computational thought processes, procedures, and results to others
- Collaborate with peers on computing activities



Focal Knowledge and Skills in ECS

ECS Unit	Focal KSA	Computational Thinking Practice
Unit 1: Human Computer Interaction	Students are able to explain why an object is or is not a computer	Analyze the effects of developments in computing.
Unit 2: Problem Solving	Students are able to compare the tradeoffs between different algorithms for solving the same problem	Design and implement creative solutions and artifacts.
Unit 3: Web Design	Students are able to apply abstraction to separate style from content during web page design and development	Apply abstractions and models.
Unit 4: Introduction to Programming	Students are able to evaluate debugging and testing methods in terms of how they relate to the problem or program	Analyze their computational work and the work of others.

Engineering Practices	CS/CT Practices	Notes
1. Asking questions (for science) and defining problems (for engineering)	<i>Analyzing the Effects of Developments in Computing</i> <i>Connecting Computation with Other Disciplines</i>	<p>..have to understand problems to which computing can be applied in order to define problems and solve them responsibly.</p> <p>...have to be able to see how problems in other domains can be solved computationally.</p>
4. Analyzing and interpreting data	<i>Analyzing their Computational Work & the Work of Others</i>	<p>Reusing code involves such exploration. “Data” can include data produced by computation.</p> <p>Computing emphasizes testing, debugging, and critical thinking about the limits of computing</p>
6. Constructing explanations (for science) and designing solutions (for engineering)	<i>Designing and Implementing Creative Solutions and Artifacts</i> <i>Analyzing their Computational Work & the Work of Others</i>	Computing emphasizes reuse and novelty in problem solving. Multiple solutions are expected and encouraged, and students learn to investigate and measure solution accuracy, efficiency and elegance.



Goal of this Work

- Make it easy for teachers to use computing concepts to satisfy performance expectations in the NGSS, and continue to democratize access to computing and computational thinking education.