Curriculum Committee

Thursday, May 28, 2015 4:30 PM
Curriculum Committee, L.P. Wilson Community Center, Room 17, 601 Matianuck Avenue, Windsor, CT 06095

1. **Call to Order, Pledge to the Flag and Moment of Silence**
2. **Audience to Visitors**
3. **Music Fundamentals**
4. **Economics**
5. **Grade 7 Health**
6. **NGSS Update and Survey**
7. **Adjournment**

CONNECTICUT STATE DEPARTMENT OF EDUCATION

An Invitation to Consider Next Generation Science In Connecticut

Date: May 28, 2015
Presented to: Windsor Public Schools Board of Education Curriculum Subcommittee
Presented by: Christine Tedisky

Foreword

The information regarding curriculum and assessment transition timelines described in this presentation has not yet been detailed or formally accepted, either by the State Board of Education or the Connecticut General Assembly. In an effort to be transparent and inclusive in its NGSS pre-adoption processes, preliminary information about transitioning to new state assessments has been included and is subject to change.

Next Generation Science in Connecticut
CSDE Pre-Adoption Stakeholder Communication Plan

2015

April (Group A)	May (Group B)	June (Group C)	July
Superintendents and Asst. Supts. • Commissioner letter • Acad Office Newsletters • RESC Curriculum Councils	Superintendents and Asst. Supts. • Presentations and feedback survey facilitated by district science leaders		
Union leaders • TBD	Local school boards • CABE webinar (May 21) • Presentations and feedback survey facilitated by district science leaders		
Legislature • TBD	Principals • Presentations and feedback survey facilitated by district science leaders	Principals • CAS webinars (May 26, 27)	
	Families • CT PTA Focus Group (Westport Town Hall, May 19)	Families • Community and Family Engagement Network "Brunch & Learn" (Mystic Aquarium, June 17)	
	Education Advocacy Grou	cation Advocacy Groups • Special education, English language learners (Mystic	Ready to report to SBE
	• CT Academy of Scientists and Engineers Focus		

CSDE

Stakeholder Engagement and Communication

- State Board of Education has prioritized *transparency* and *inclusivity* in all standards adoption processes
- Build on 2 years of outreach to science community; now reach beyond to diverse stakeholders
- 2-way communication is at the core: info and feedback

PRE-ADOPTION SHORT-TERM GOALS:

- Raise public awareness of Next Gen Science and its implications for teaching and learning of science and STEM.
- Gain public support for upgrading to new science standards
- Extensive public outreach campaign May through July
- Report to State Board

CSDE

A Vision for Science Education

"Students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of each fields' disciplinary core ideas."

Framework Ch.1

Goals of Science Education

The *Framework's* vision expresses 2 major goals for K-12 science education:

(1) Educating all students in science and engineering.

(2) Providing the foundational knowledge for those who will become the scientists, engineers, technologists, and technicians of the future.

A Vision for Science Education in Connecticut

- Harness educator passion & knowledge to inspire & engage ALL students
- Graduate students who stay in-state pursuing careers with CT STEM companies
- Graduate informed citizens who can reason logically, think critically, and address local and global challenges.

Why Upgrade Connecticut Science Standards?

- Next step for CT's 10-year old science standards
- Large achievement gaps on state assessments
- Bring clarity to "STEM" education
- Advances in science and technology
- Advances in understanding how students learn science

Why Upgrade Connecticut Science Standards?

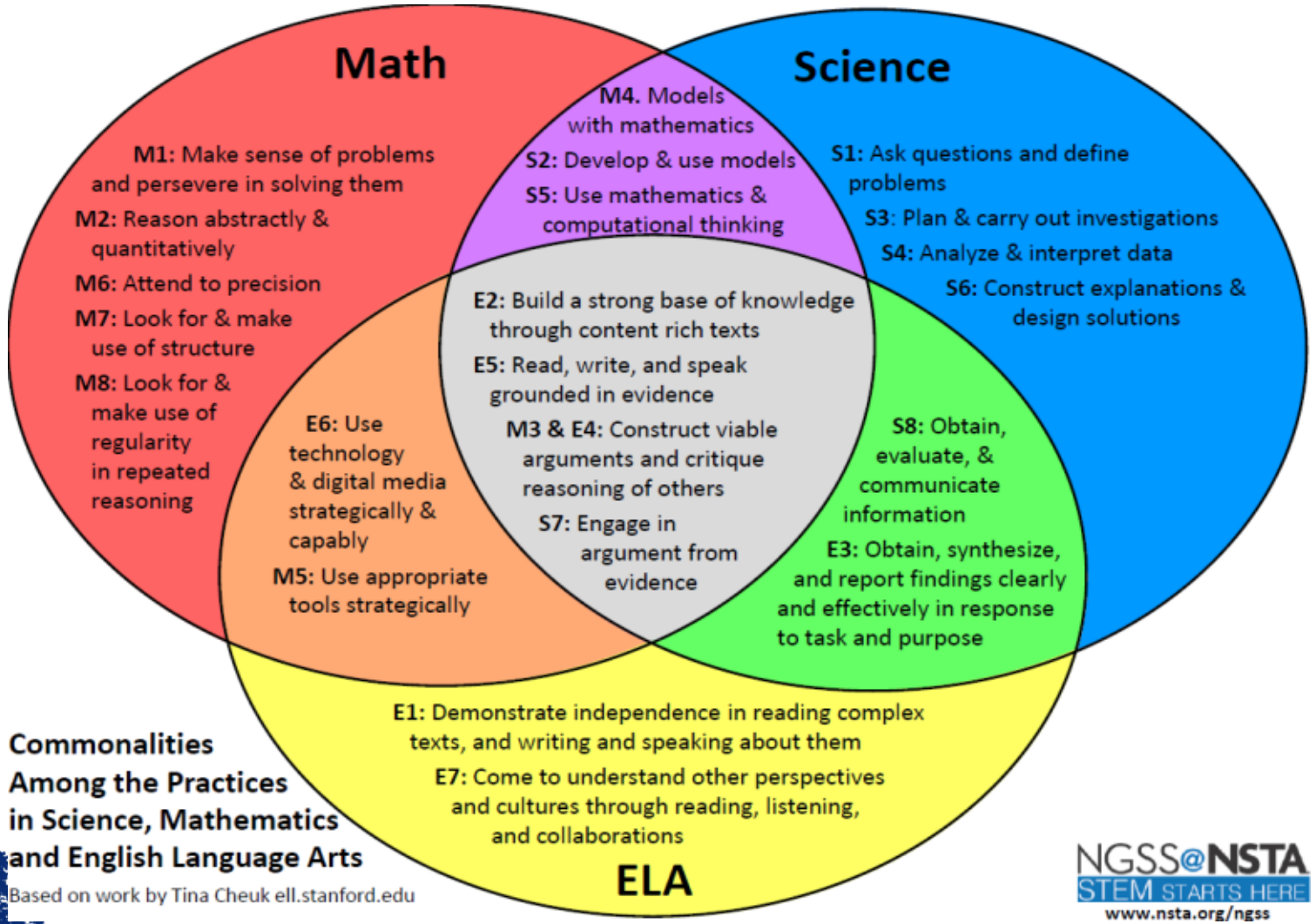
- Stronger alignment with CT Core Standards in Mathematics and Language Arts
- "21st Century" career-readiness skills bring engineering, problem-solving, analytical thinking and communicating to the foreground
- Science observation, argumentation and discourse develops language skills
- Internationally benchmarked standards keep CT students globally competitive
- AP tests have been redesigned to reflect more reasoning with evidence and less memorization

Why Upgrade Connecticut Science Standards?

- Alignment with college/career readiness standards in other disciplines
- Many of today's (and future) jobs require STEM knowledge
- Many STEM jobs pay well and don't require advanced degrees
- CT has lots of jobs in STEM industry that could be filled by CT students

COMPARISON OF NGSS AND CT STANDARDS

Connections to Common Core



Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Cheuk ell.stanford.edu

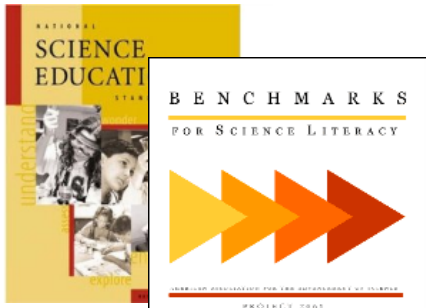
NGSS@NSTA STEM STARTS HERE www.nsta.org/ngss

Potential Benefits of Adoption of NGSS

- Alignment to College Board AP Science standards
- Greater equity and consistency across CT districts
- Enhanced teaching practices reflecting current research
- Collaboration across states on instructional materials, assessments and professional development
- Clarify identity of “STEM” education in CT
- Improve reading, writing, speaking and listening skills
- Improve mathematics practice and knowledge

Development of Next Generation Science Standards

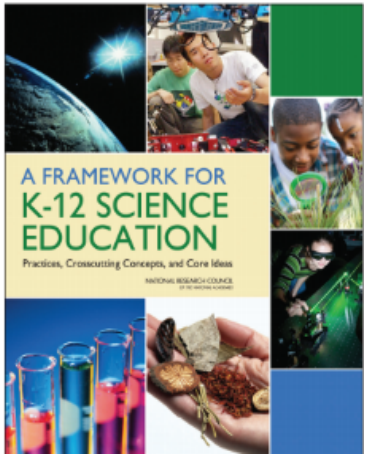
Building on the Past…
Reaching Toward the Future



1990s

1990s-2009

Phase I



January 2010-July 2011

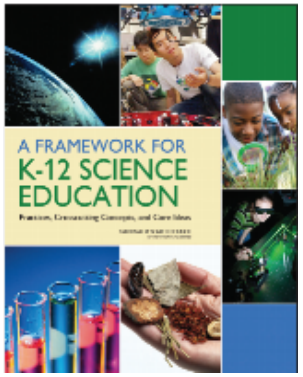
Phase II

NEXT GENERATION SCIENCE STANDARDS
For States, By States

July 2011–April 2013

Two-Step Process…One Vision

STEP 1 - FRAMEWORK FOR K-12 SCIENCE EDUCATION



- Based on 15 years of science education research
- Written by teams of scientists (including 2 Nobel Laureates), science educators, education researchers, and state leaders
- Envisions a new approach to inspiring and preparing all students for life, college, careers and global competitiveness
- Describes 3 integrated dimensions of knowing science: Practices, Core Ideas and Crosscutting Concepts all students should know
- Provides a foundation for development of specific learner outcomes

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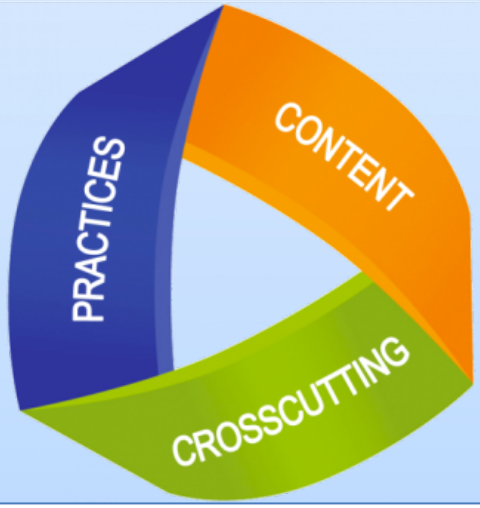
STEP 2 - NEXT GENERATION SCIENCE STANDARDS (NGSS)

NEXT GENERATION SCIENCE STANDARDS
For States, By States

- Written by 41 accomplished science educators guided by 26 Lead States
- Based upon Framework research and recommendations
- Adds "3-Dimensional" Student Performance Expectations
- Adds Connections to Common Core
- Adds Appendices for elaboration

Overview of Next Generation Science Standards



How Do NGSS Differ From Previous Science Standards?

MORE EMPHASIS

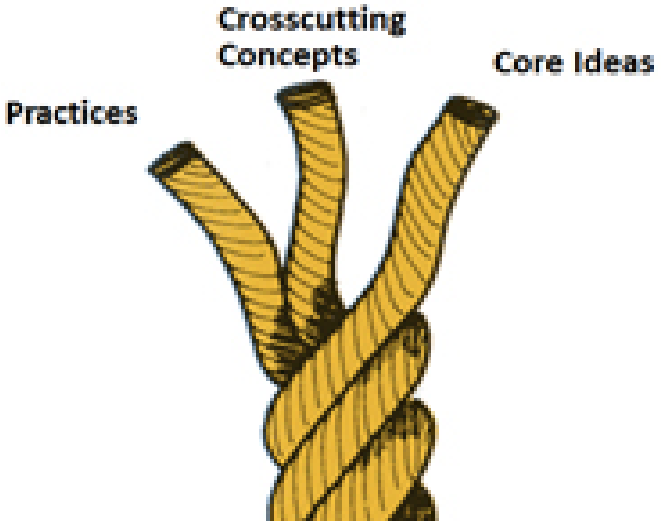
- Students *developing* explanations using evidence
- Students investigating explanations of *real-world phenomena*
- Students reading various *informational news* articles, magazines, journals and web-based resources

LESS EMPHASIS

- Students *repeating* explanations given by teacher or textbook
- Students *following instructions* to do experiments
- Students reading *textbooks* and answering questions at the end of the chapter

Students Learn Through 3 Intertwined "Dimensions" of Science

The NGSS are written as "Performance Expectations that blend a Practice with a **Core Idea** and a Crosscutting Concept.



Engineering
Integrated with Science

SAMPLE NGSS PERFORMANCE EXPECTATION WITH 3 DIMENSIONS

Analyze and interpret data to provide evidence that **plants and animals have traits inherited from parents** and that variation of these traits exists in a group of similar organisms.

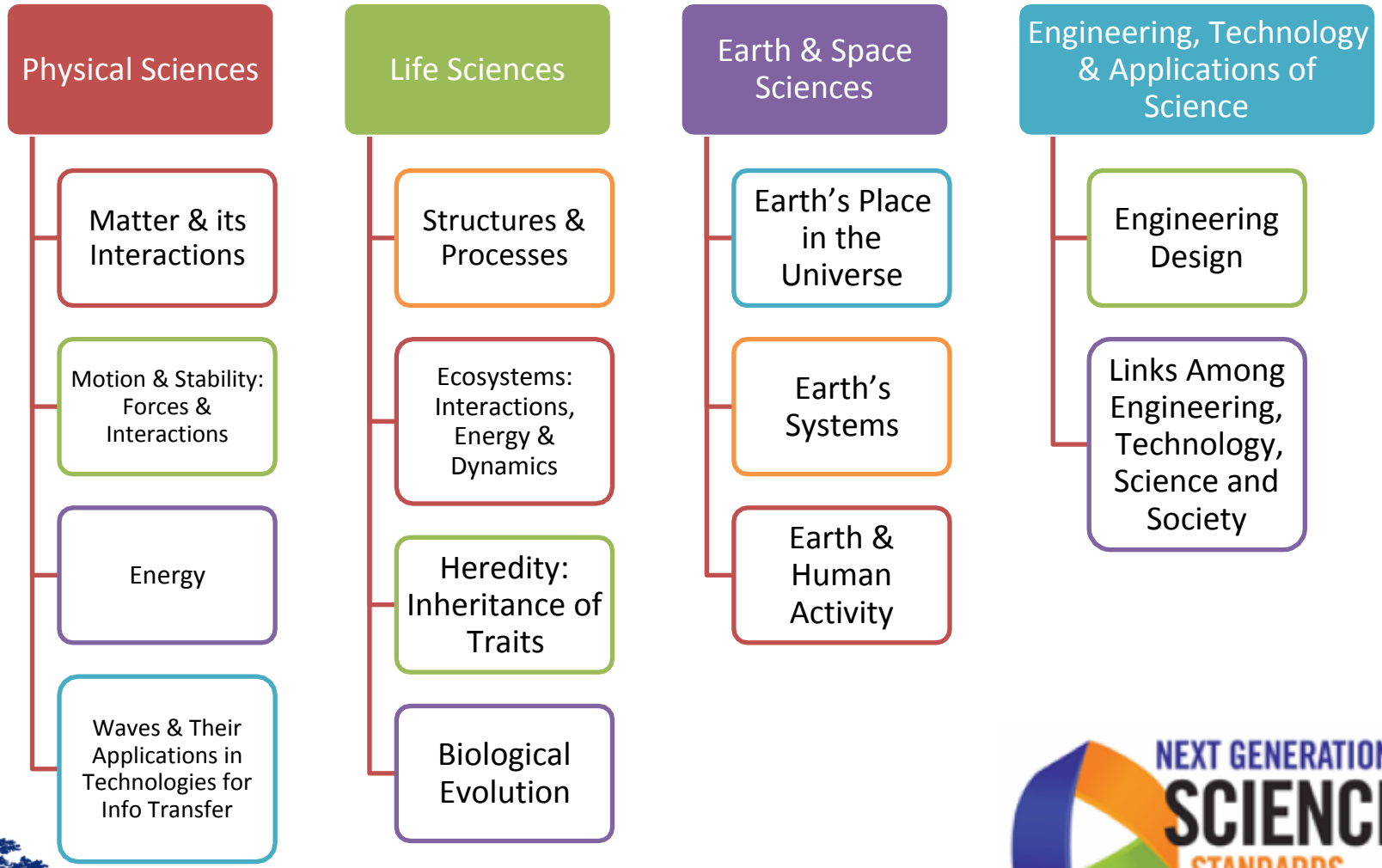
Science and Engineering Practices: Central to Next Gen Science Learning

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. Developing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Comparison of CT Inquiry Standards to NGSS Practices

CONNECTICUT INQUIRY	NGSS PRACTICES
• 2 separate dimensions (inquiry, content) • Engineering concepts appears once in grade 8 • Students conduct experiments and report findings	• 3 integrated dimensions (practices, core ideas, cross cutting concepts) • Engineering design integrated into all K-12 standards • Students construct evidence-based explanations and apply knowledge to explain real-world phenomena

Core Disciplinary Ideas



NEXT GENERATION SCIENCE STANDARDS

Crosscutting Concepts

Cause and Effect

Patterns

Structure and Function

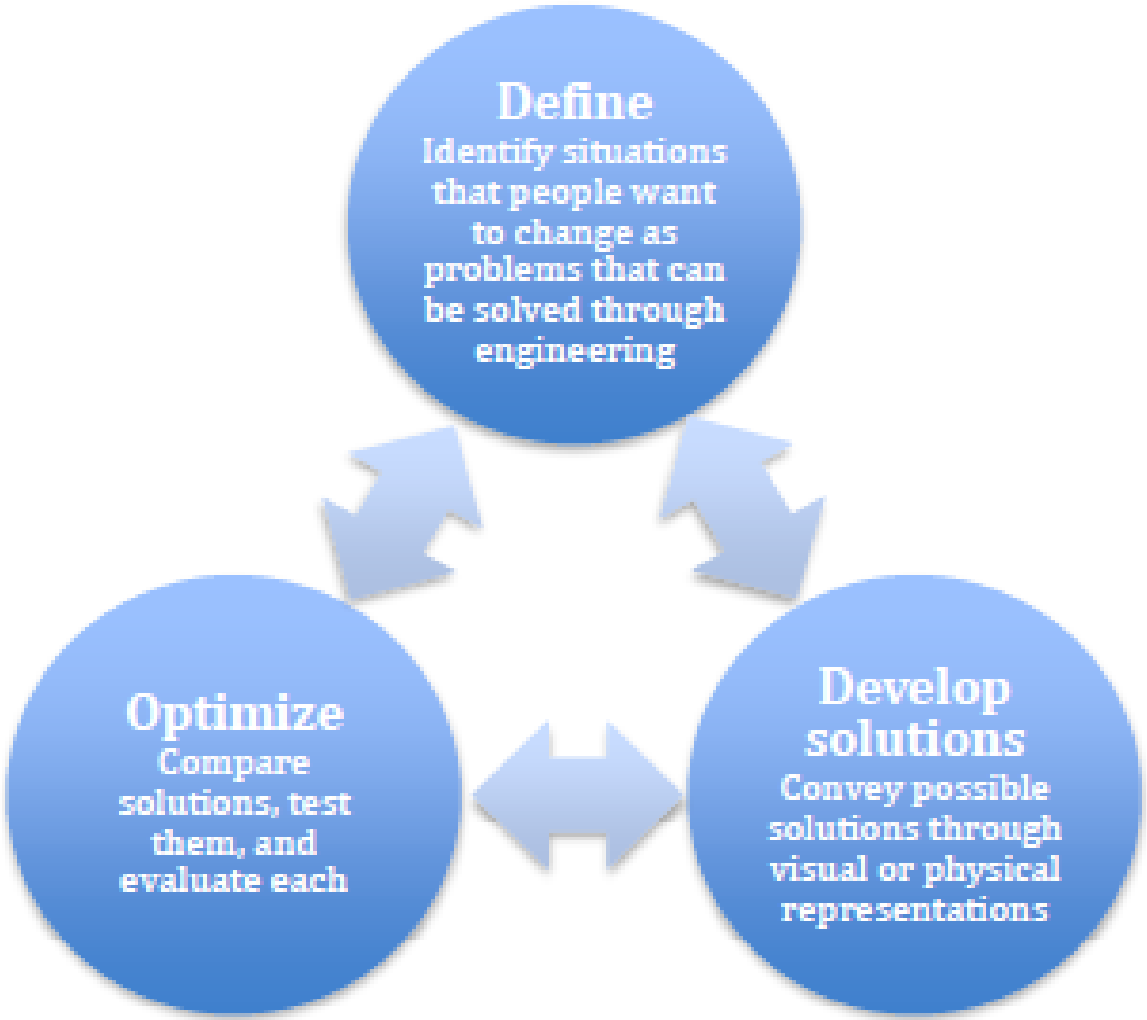
Systems

Scale

Change and Stability

Matter and Energy

Engineering Design Cycle:
Apply Science Knowledge to Solve Real World Problems



Engineering Design Integrated with Science

Sample Learner Outcomes from NGSS:

KINDERGARTEN PHYSICS: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*K-PS2-2.

GRADE 3 LIFE SCIENCE: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.*3-LS4-4.

GRADE 6-8 PHYSICS: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*MS-PS3-3.

GRADE 9-12 LIFE SCIENCE: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*HS-LS2-7.

Measuring Success

Assessing Next Generation Science Learning

Connecticut: One Dimension (at a time)	NGSS: Three Dimensions (simultaneously)
Describe the effects of the strengths of pushes and pulls on the motion of objects.	***Plan and conduct an investigation to provide evidence*** of the effects of balanced and unbalanced forces on the motion of an object.
Describe the basic structures of an animal cell, including the nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.	***Develop and use a model*** to describe the function of a cell as a whole and ways parts of cells contribute to the function.
Provide explanations to investigated problems or questions.	***Use evidence to support the explanation*** that traits can be influenced by the environment.

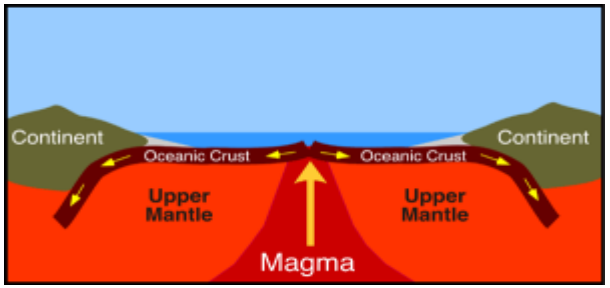
Sample Test Questions: Traditional and NGSS

Traditional

The major movement of the plates and description of plate boundaries of the Earth are...

A. Convergent
B. Divergent
C. Transform
D. All of the Above

NGSS-style



A. Draw on the picture to show what is happening in the mantle that causes the plates to move apart.

B. What is happening in the mantle that helps to explain why the two plates are moving apart?

C. Put an X on the places in the picture above where the oldest rock can be found in the crust.

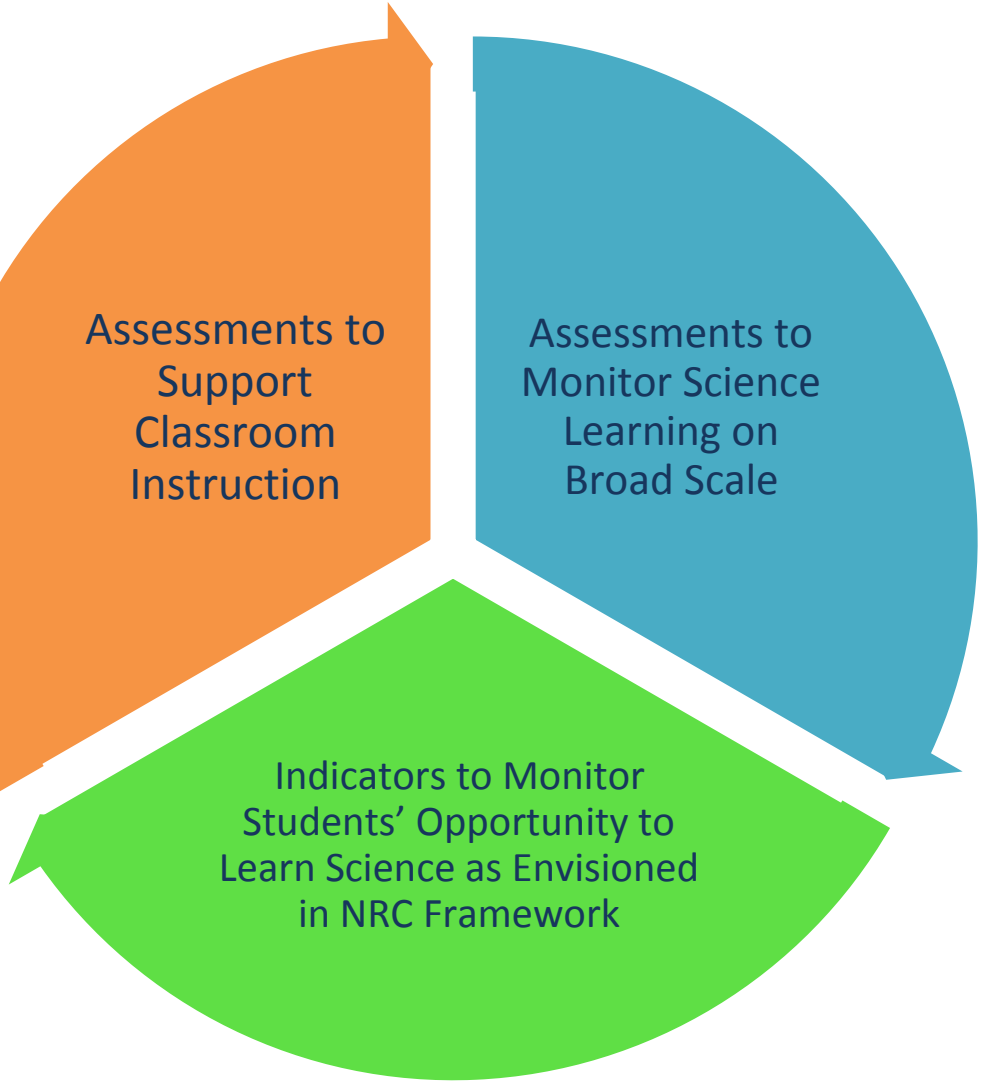
D. Explain your answer.

Envisioning a New System of Assessments

MORE TIMELY

MORE INFORMATIVE

A BETTER PROFILE OF STUDENT LEARNING



Proposed Transition to Next Generation Science State Assessments

	Spring 2016	Spring 2017	Spring 2018	Spring 2019
CMT and CAPT Science (cumulative tests at Grades 5 and 8; high school)	Aligned to CTSS	Aligned to CTSS	Aligned to CTSS	First live administration of state assessment aligned with NGSS
Next Gen Science Assessment Development	NGSS item piloting	NGSS item piloting; Report NGSS "Readiness"	NGSS item piloting; Report NGSS "Readiness"	TBD

CTSS = Current Connecticut Science Standards (adopted in 2004)

NGSS = Next Generation Science Standards (adoption under consideration)

Making Transitions
How will science teaching, learning and assessment be different?

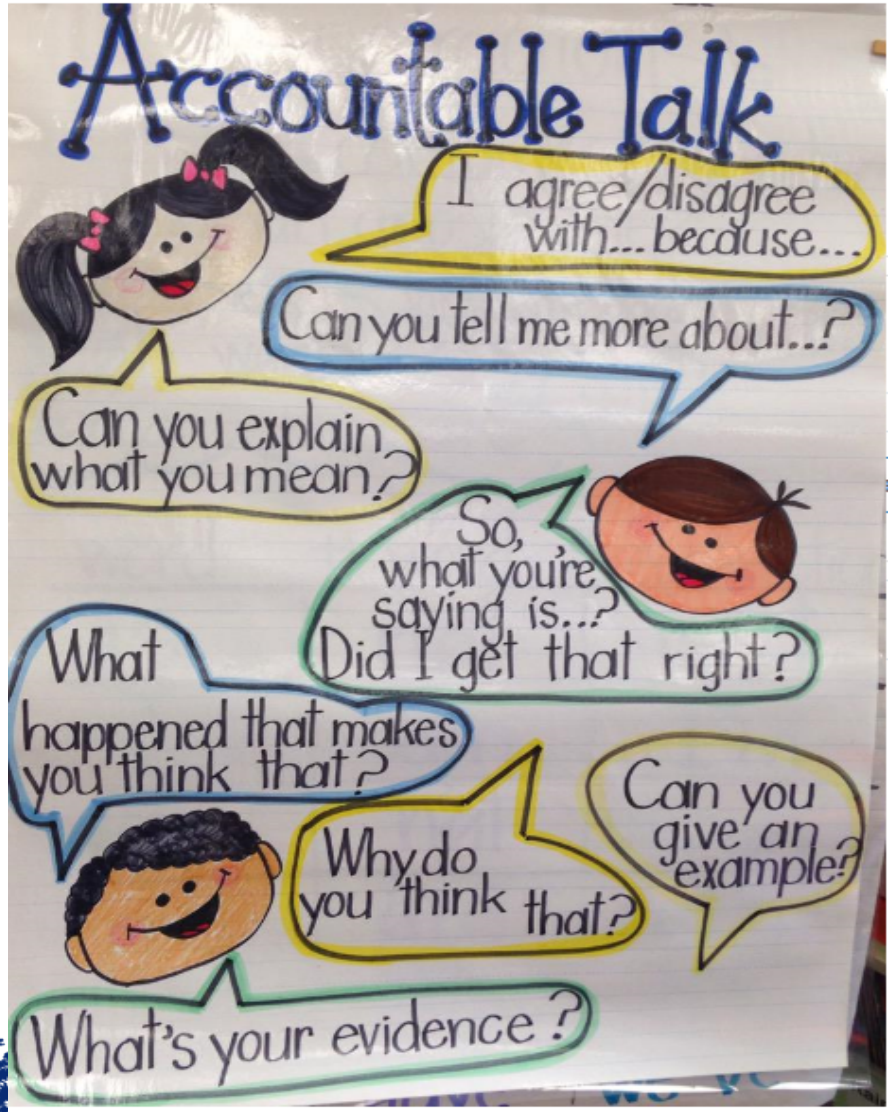
Equitable Opportunities to Reason with Evidence

A video example of sense-making discourse among diverse students:

"Is it weight or volume that makes the water level rise when you drop an object that sinks into a glass of water?"

https://www.dropbox.com/sh/72az27pbc1m9461/AAAIdorYGWjKZ71XiRHTmhExa#lh:null-TP01_Classroom_Discussion_Final_v2_sub_sm_H264.mov

Building Critical Thinking Through Discourse



Example of classroom "talk starters" that support critical thinking in all subject areas by teaching students to make evidence-based arguments

Grade 2 Classroom Poster – Wallingford, CT
Teacher: Lori Farkash

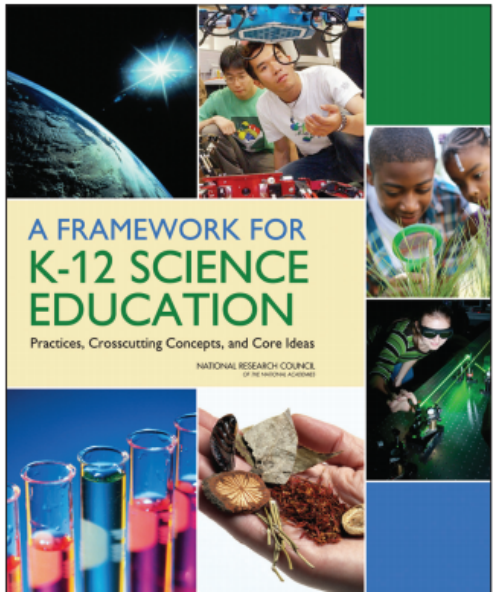
A Model for Transitioning District Curriculum and Instruction*

CTSS = Connecticut's current state science standards (CSDE, 2004)
NGSS = Next Generation Science Standards (Lead States, 2013)

Grade	2015-16	2016-17	2017-18	2018-19
PK-3	CTSS	**NGSS**	**NGSS**	**NGSS**
4	CTSS	CTSS	**NGSS**	**NGSS**
5	CTSS	CTSS	CTSS	**NGSS**
6	CTSS	**NGSS**	**NGSS**	**NGSS**
7	CTSS	CTSS	**NGSS**	**NGSS**
8	CTSS	CTSS	CTSS	**NGSS**
9	CTSS	**NGSS**	**NGSS**	**NGSS**
10	CTSS	CTSS	**NGSS**	**NGSS**
11-12	CTSS	CTSS	CTSS	**NGSS**

* Other models are under consideration and will be available soon.

Resources Available for District-Led Study Groups



The Foundation for the NGSS:
http://www.nap.edu/catalog.php?record_id=13165

NEXT GENERATION SCIENCE STANDARDS

NGSS Standards, Appendices and Resources:
http://www.nextgenscience.org

NSTA National Science Teachers Association

Webinars, Parent Information, and Teaching Resources:
http://www.nsta.org/about/standardsupdate/

Cost Considerations

1. Investment in high quality NGSS professional learning: fees, release time and subs
2. Adapting and/or acquiring NGSS “3-dimensional” instructional materials

   - Limited commercially-available instructional materials at present

3. Adequate staffing, space & scheduling for 3 years of HS science for ALL students
4. Materials and supplies for elementary science teaching and learning.

Professional Learning: The Key to Success

Before buying NGSS teaching materials…

Learn about the vision of science teaching and learning described in the NRC Framework:

Build District Capacity through on-going professional learning to enhance science teaching practices.

Transitioning to New Approaches to Teaching, Learning and Assessing Science

2014: Professional development for pre-service university faculty and in-service teachers and administrators

2015: Professional development for pre-service university faculty and in-service teachers and administrators; NGSS state pilot items

2015: CSDE recommendation of adoption to SBE

If NGSS is adopted by SBE in 2015, then …

2016-2018: Phased-in curriculum changes begin; PD continues; state item piloting continues and "readiness" pilot tests available for district use

2019: First administration of Next Gen science state assessments

District To Do List

2015-2016: Invest in high quality PD offered by State

2015-2017: Enroll district teams to collaborate in curriculum development institutes beginning June 2015

2016-2018: Adapt and/or acquire NGSS instructional materials

2016-2019: Expect and “look for” transformed teaching practices critical for student success on NGSS assessments

To Learn More About NGSS in CT

- CSDE Science Page http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=320890
- Ellen Cohn, Interim Chief Academic Officer, ellen.cohn@ct.gov
- Liz Buttner, Curriculum and Instruction, elizabeth.buttner@ct.gov
- Jeff Greig, Assessments, jeff.greig@ct.gov
- Ron Michaels, Performance Tasks, ronald.michaels@ct.gov

Stakeholder Survey

https://www.surveymonkey.com/s/PreadoptionNGSS

Key Points of NGSS Presentation

Christine Tedisky

May 2015

- The information regarding curriculum and assessments for science as well as transition to NGSS timelines have NOT been formally accepted or approved by the State Board of Education or the Connecticut General Assembly.
- Next Generation Science Standards were developed in April 2013 and are based on the National Research Council's publication "A Framework for K-12 Science Education" (2012).
- Next Generation Science Standards are NOT the same as the Common Core State Standards for ELA and Math - they are a completely separate entity that have no federal funding or incentives backing them for states to adopt them.
- The Connecticut State Board of Education was presented with the Next Generation Science Standards in February 2015 for their consideration. The SBoE has requested feedback from all stakeholders in local districts (superintendents, assistant superintendents, local BoE, and families) before they make a decision on adoption of these standards - the decision could be as early as Fall 2015, but may be later.
- Key features of NGSS:
    - Standards are written as performance expectations ("Students who demonstrate understanding can…")
    - 3-dimensional - each standard incorporates "practices," "crosscutting concepts," and "disciplinary core ideas"
        - Science and Engineering Practices are a clarification of the term "inquiry" - they define HOW students will interact with science ideas to GATHER evidence, REASON with evidence, and COMMUNICATE explanations
        - Crosscutting Concepts are broad themes that have application across all domains of science (Cause and Effect, Structure and Function, Stability and Change, Patterns, etc.)
        - Disciplinary Core Ideas are those that have BROAD importance across multiple sciences (i.e., Physical Sciences - Structure and Properties of Matter; Life Sciences - Growth and Development of Organisms; Earth and Space Sciences - Earth and the Solar System; Engineering - Defining and Delimiting and Engineering Problem - these are just a FEW examples) - core ideas are revisited across the grade levels at increasing levels of complexity
    - Each standard identifies connection between ELA and Math Common Core skills
    - Engineering Design is key across all grade levels
- Assessments for these new standards have NOT been developed and are NOT part of Smarter Balanced Assessments. CMT (grades 5 and 8) and CAPT (grade 10) WILL remain as they are at least through Spring 2016, with potential for piloting NGSS-style questions in 2017 and 2018. The current thinking is that full implementation of the NGSS assessment will be in Spring 2019. Unclear about which grade levels will be assessed.
- Assessments, when developed, will assess all 3-dimensions simultaneously. Assessments will likely be computer-based, and possibly adaptive.
- Teachers should incorporate the "Science and Engineering Practices" as aligned to their current (based on CT Science Standards) curriculum at each grade level. Also, teachers should continue to engage students in discourse and evidence-based reasoning and critical thinking. Teachers should begin to move towards performance-based assessments for science. Much of this work is already being done at the secondary level.