

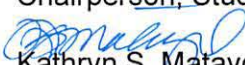


STATE OF HAWAII
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

September 1, 2015

TO: The Honorable Patricia Halagao
Chairperson, Student Achievement Committee

FROM: 
Kathryn S. Matayoshi
Superintendent

SUBJECT: **Presentation on Next Generation Science Standards ("NGSS"): Overview and Update**

1. DESCRIPTION

"Quality science education is based on standards that are rich in content and practice, with aligned curricula, pedagogy, assessment, and teacher preparation and development. It has been nearly 15 years since the National Research Council and the American Association for Advancement in Science produced the seminal documents on which most state standards are based. Since that time, major advances in science and our understanding of how students learn science have taken place and need to be reflected in state standards,"
Next Generation Science Standards: For States, By States.

2. PRESENTATION

The attached presentation provides an overview and information about the NGSS, new K-12 science standards. These standards are rich in content and practice, and arranged in a coherent manner to provide all students an internationally-benchmarked science education.

KSM:CSM:itk

Attachment

c: Board of Education Members
Office of Curriculum, Instruction and Student Support



Next Generation Science Standards: Overview and Update

Hawaii State Board of Education
Student Achievement Committee
September 1, 2015

inspire science



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Why science?

*Every generation has
the obligation to free
men's minds for a look
at new worlds . . . to
look out from a higher
plateau than the last
generation.*

~Ellison Onizuka



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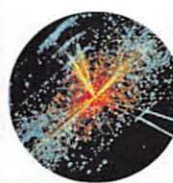


Why new standards in science?

- What has changed since science standards were last written?
 - NSES came out in 1996



- HCPS III came out in 2007



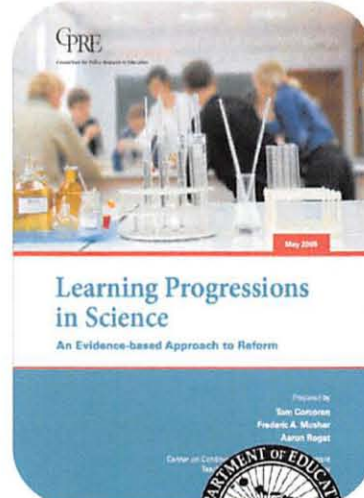
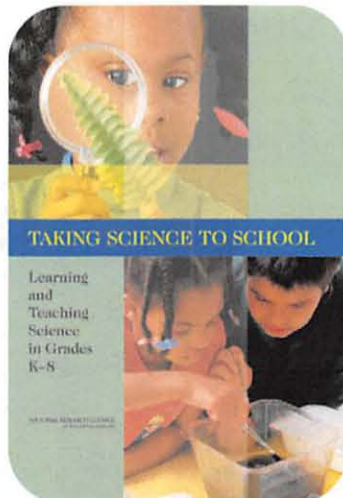
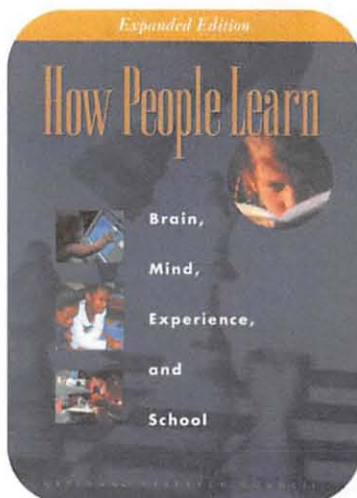
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Why new standards in science?

- What has changed since science standards were last written?



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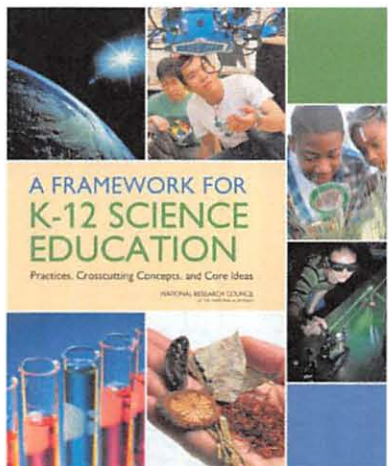
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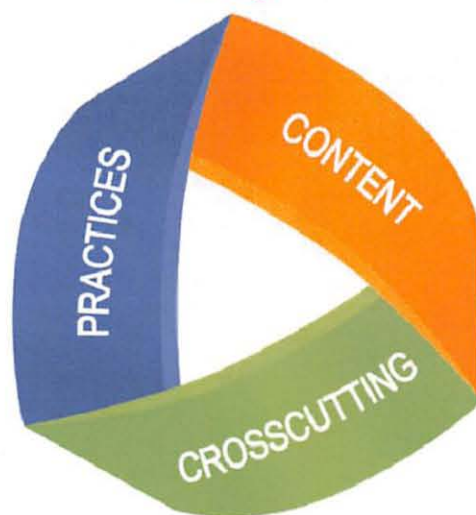


Framework to Standards

2011



2013

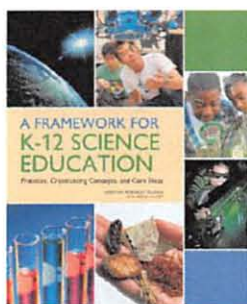


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Framework to Standards



Disciplinary Core Ideas

- Physical Science
- Life Science
- Earth and Space Science
- Engineering

Practices of Science and Engineering

1. Asking Questions and Defining Problems
2. Planning and Carrying Out Investigations
3. Analyzing and Interpreting Data
4. Developing and Using Models
5. Constructing Explanations and Designing Solutions
6. Engaging in Argument from Evidence
7. Using Mathematics and Computational Thinking
8. Obtaining, Evaluating, and Communicating Information

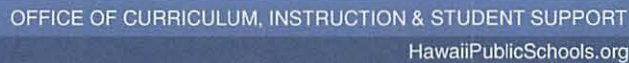
Crosscutting Concepts

1. Patterns
2. Cause and Effect: Mechanism and Explanation
3. Scale, Proportion, & Quantity
4. Systems & System Models
5. Energy & Matter: Flows, Cycles, & Conservation
6. Structure & Function
7. Stability & Change

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I would enjoy a science class that. . .	
Lets me make connections between different science concepts and disciplines	82%
Puts me in the role of a scientist as part of a scientific community	76%
Connects to ideas I had learned in the past	85%
Lets me apply my knowledge in many different and creative ways	85%
Includes engineering skills and ideas	79%
Prepares me for taking science classes in college	85%
Integrates other disciplines, such as language arts, math, arts, history, etc.	79%



How does NGSS address student values?

NGSS MS-LS1-1

Conduct an investigation to provide evidence that **living things are made of cells**; either one cell or many different numbers and types of cells.

[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]

HCPS III SC.7.4.1

Describe the cell theory

The student describes the theory that all organisms are made up of cells that are the basic building blocks of life; some organisms are unicellular but others are multi-cellular.

Standard 1: SCIENTIFIC INVESTIGATION

Standard 4: STRUCTURE AND FUNCTION IN ORGANISMS

NGSS

- Integrates **scientific practices**, **crosscutting concepts**, and **core ideas**
- Focuses on **deep understanding and application** of knowledge
- Focuses on readiness for college, career, and citizenship

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Why new science standards? HI Teacher Perspective

1. **Coherent, articulated, rigorous standards**, which support consistent integration of science and engineering processes, to inform instruction
2. **Targeted professional development and time** to develop competencies and resources, including mentoring and support from resource teachers
3. **Resources for teaching**, including science supplies, vetted curricular materials, and sufficient lab spaces
4. **Increased awareness of the nature and value of science** by all students, families, schools, administrators, and communities
5. **Consistent programs and support** from school, complex area, and state administrators

GOAL 1
Student Success

GOAL 2
Staff Success

GOAL 3
Systemic Support

K-PS2 Motion and Stability: Forces and Interactions

K-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

K-PS2-2. 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.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. - With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1) Analyzing and Interpreting Data Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. - Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)	PS2.A: Forces and Motion - Pushes and pulls can have different strengths and directions. (K-PS2-1),(K-PS2-2) - Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1),(K-PS2-2) PS2.B: Types of Interactions - When objects touch or collide, they push on one another and can change motion. (K-PS2-1) PS3.C: Relationship Between Energy and Forces - A bigger push or pull makes things speed up or slow down more quickly. (secondary to K-PS2-1) ETS1.A: Defining Engineering Problems - A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary to K-PS2-2)	Cause and Effect Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world. (K-PS2-1)

Connections to other DCIs in kindergarten K.ETS1.A (K-PS2-2); K.ETS1.B (K-PS2-2)

Articulation of DCIs across grade-levels: 2.ETS1.B (K-PS2-2); 3.PS2.A (K-PS2-1),(K-PS2-2); 3.PS2.B (K-PS2-1); 4.PS3.A (K-PS2-1); 4.ETS1.A (K-PS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

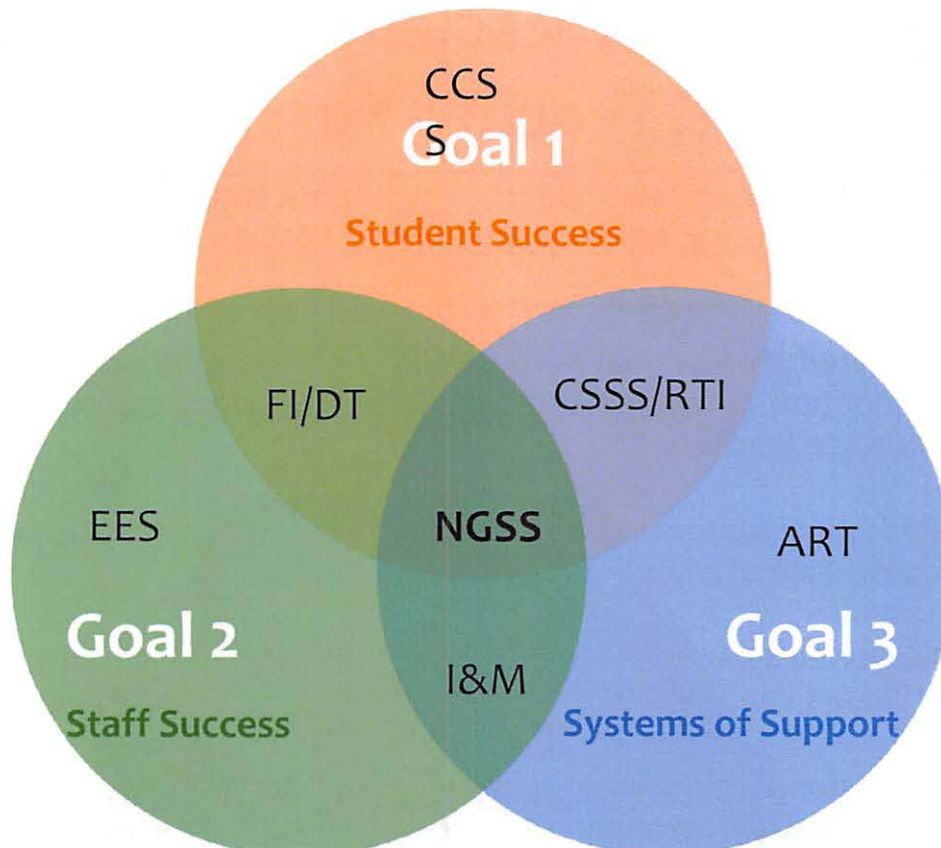
SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (K-PS2-1)

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)





How does NGSS address teacher needs?

I appreciate the way in which the new science standards are built to encourage teaching in a way that develops deep understanding—it mirrors the shift in LA and math that we see in CCSS.

– HIDEOE Elementary Science Teacher

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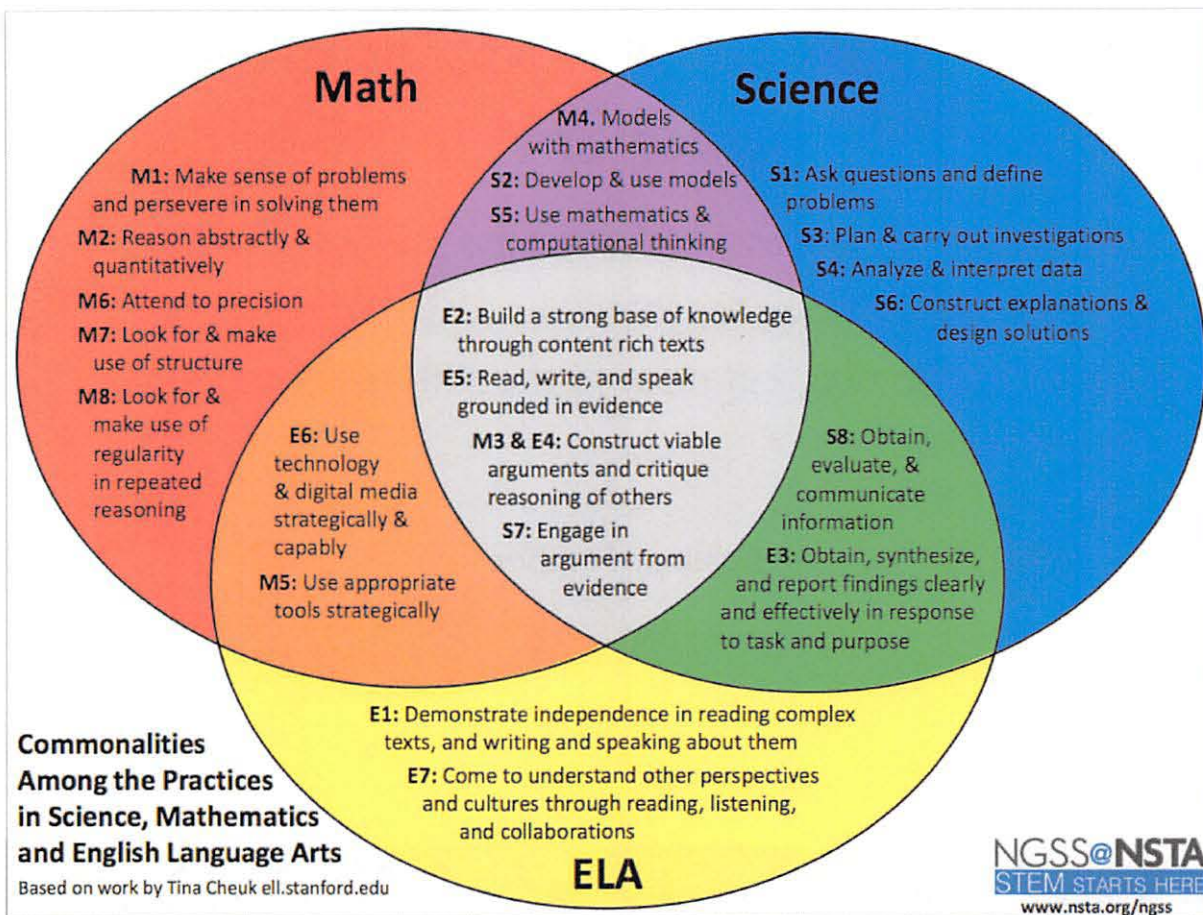
How does NGSS address teacher needs?

- NGSS developed to ensure consistency with CCSS
 - Focus on literacy through reading, writing, and speaking
 - Math in NGSS should not outpace or misalign with CCSS
 - Writers of NGSS have created model integrated tasks
 - Interpret data to evaluate the effectiveness of ocean wave energy converters and create a report of recommendations for a community considering purchasing these devices
 - Use graphical analysis to determine the causes of bee colony collapse disorder and construct an argument for how continued trends in bee colony numbers might be impacting the stability and biodiversity of ecosystems and agricultural systems in which the bees participate

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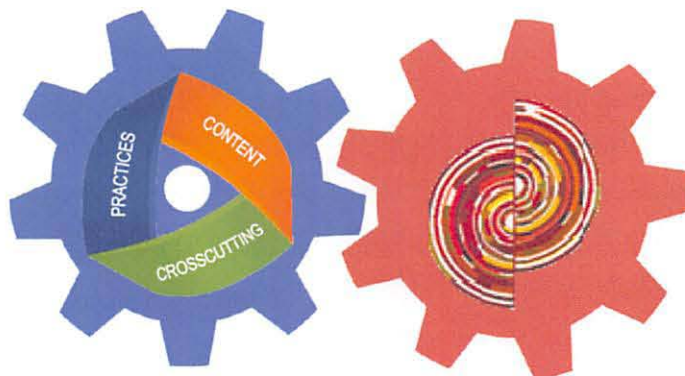
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How does NGSS address teacher needs?

- NGSS and CCSS support each other, however,
 - NGSS is not Common Core Science
 - CCSS ELA Literacy for Science & Technical Subject Standards are not Science standards





How does NGSS address teacher needs?

♥ the NGSS pacing and clarity; ♥ the focus on questioning and explanation/communications.

– HIDOE 6th Grade Science Teacher

It is very user friendly and it helps novices like me helping children to start wondering about their environment.

– HIDOE Science Teacher

This will definitely help to get kids more engaged, make it meaningful, and get them to think deeper.

– HIDOE Curriculum Coordinator



National and Local Support

If you're a science educator, unless you're a troglodyte (which let's face it, every department has at least one of), you've probably been paying attention to the development of the Next Generation Science Standards or NGSS... I am excited about the new standards because they represent a fundamental shift in thinking away from content to how science is practiced in the real world.

–Sage Lichtenwalner, Ocean Data Scientist and Outreach Educator, Rutgers University

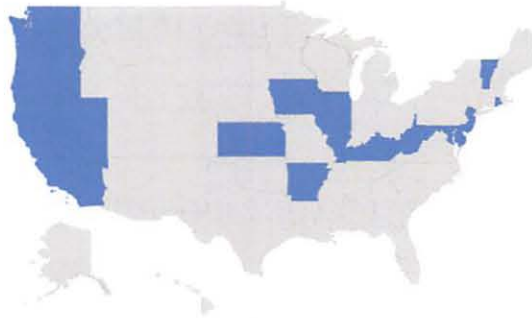
- National Science Teachers Association
- The Council of Chief State School Officers
- American Federation of Teachers, National Education Association
- Chevron, Eli Lilly, Microsoft, 3M
- University of Hawaii at Manoa College of Education
- Local education partners
 - UH, multiple departments
 - Science Olympiad
 - NOAA and NASA





National Progress

- NGSS has been adopted by 15 states + Washington, DC
- Additional states
 - have adopted “NGSS similar” standards
 - are preparing for or considering NGSS adoption



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Hawaii Progress

- Presented background/updates to CAS and principals meetings
- Provided quarterly updates to schools via OCISS Science/STEM Update
- Science Content Panel provided input regarding multiple aspects of NGSS
- Held Science Kickstart, June 15, 2015 (~150 attendees)
 - *Loved spending my summer here... mahalo, thank you*
 - *Re-igniting my love for science and reminding me how much fun it can be. Thank you!*
 - *Will there be more workshops like this, because I learned a lot and would like to learn more!?*
- Middle Grades Science and Engineering Cohort (13 teachers)

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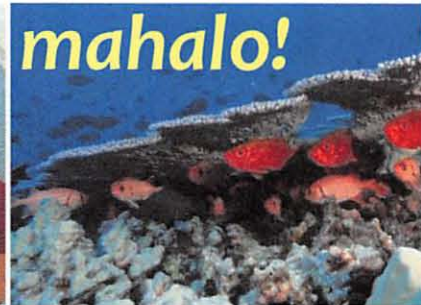


Moving Forward

- Hold joint professional development sessions NGSS + C3
- Hold focused sessions for secondary department chairs
- Convene Science Work Group
- Solicit additional feedback
- Create webinars and support materials
- Develop Wonders + Science materials and PD
- Revise secondary ACCN courses
- Plan for assessment transition

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“What the future holds in store for individual human beings, the nation, and the world depends largely on the wisdom with which humans use science and technology.” - Science For All Americans (AAAS)

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<http://www.nextgenscience.org>

