

The Washington State Board of Education

Governance | Accountability | Achievement | Oversight | Career & College Readiness

Title:	Next Generation Science Standards—Adoption Considerations	
As Related To:	<input type="checkbox"/> Goal One: Effective and accountable P-13 governance. <input type="checkbox"/> Goal Two: Comprehensive statewide K-12 accountability. <input type="checkbox"/> Goal Three: Closing achievement gap.	<input type="checkbox"/> Goal Four: Strategic oversight of the K-12 system. <input checked="" type="checkbox"/> Goal Five: Career and college readiness for all students. <input type="checkbox"/> Other
Relevant To Board Roles:	<input type="checkbox"/> Policy Leadership <input checked="" type="checkbox"/> System Oversight <input type="checkbox"/> Advocacy	<input type="checkbox"/> Communication <input type="checkbox"/> Convening and Facilitating
Policy Considerations / Key Questions:	What are the key questions that need to be addressed prior to the Superintendent of Public Instruction's consideration of adoption of the Next Generation Science Standards?	
Possible Board Action:	<input checked="" type="checkbox"/> Review <input type="checkbox"/> Adopt <input type="checkbox"/> Approve <input type="checkbox"/> Other	
Materials Included in Packet:	<input checked="" type="checkbox"/> Memo <input type="checkbox"/> Graphs / Graphics <input checked="" type="checkbox"/> Third-Party Materials <input type="checkbox"/> PowerPoint	
Synopsis:	<p>SBE will have the opportunity to ask questions and discuss the Next Generation Science Standards with OSPI staff. The SBE will identify key questions that will inform the discussion of the Next Generation Science Standards at the July 2013 Board Meeting.</p> <p>The role of the SBE is to provide consultation to the Superintendent of Public Instruction, who will consider adoption of the standards for the state in July 2013.</p>	

NEXT GENERATION SCIENCE STANDARDS

Policy Consideration

The Next Generation Science Standards (NGSS) were released on April 9, 2013. The State Board of Education (SBE) may consider endorsing the standards at the July 10-11, 2013 meeting. SBE discussion and deliberation may inform the consideration of the Superintendent of Public Instruction to adopt the standards for the state in summer, 2013.

According to RCW 28A.655.068 (3) the Superintendent of Public Instruction may modify state learning standards and assessments in science in consultation with the SBE:

(3) The superintendent of public instruction may participate with consortia of multiple states as common student learning standards and assessments in science are developed. The superintendent of public instruction, in consultation with the state board of education, may modify the essential academic learning requirements and statewide student assessments in science, including the high school assessment, according to the multistate common student learning standards and assessments as long as the education committees of the legislature have opportunities for review before the modifications are adopted, as provided under RCW [28A.655.070](#).

Summary

Please review this TVW video of House Education Committee Work Session April 11, 2013, update on the Next Generation Science Standards: http://twv.org/index.php?option=com_twvplayer&eventID=2013041051

The PowerPoint presentation for this video is included in this section of the meeting packet, and also may be found here: <http://app.leg.wa.gov/m/cmd/Handler.ashx?MethodName=getdocumentcontent&documentId=qeWOag55Pvl&att=false>

Background

The SBE received an update on preparation for NGSS at the March 14-15, 2012 meeting.

One of the Board's five strategic goals is to promote career and college readiness for all students. The Board's work in the area of science since 2006 has included:

- Reviewing the state's science essential academic learning requirements and grade level expectations and recommending revisions to those standards (2007-2008).
- Analyzing science course taking patterns as part of the Board's transcript study of 2008.

- Providing official comment and recommendations to the Superintendent of Public Instruction regarding the recommended science curricula (2009).
- Commissioning a review of science end-of-course assessments as exit exams (2008).
- Approving cut scores for the state science assessments (2011; August 2012).
- Approving 3 credits of science (not yet in rule) as part of the Career- and College-Ready Graduation Requirements.

Action

SBE will discuss the NGSS; members Deborah Wilds and Connie Fletcher will lead the discussion. SBE may identify key questions to be answered or discussed at the July meeting, where the SBE may consider endorsing the NGSS.

Next Generation Science Standards Work Session

Background Information for SBE Meeting May 8, 2013

Presentation to
House Education Committee
April 11, 2013



Jessica Vavrus, MPA
Asst. Superintendent
OSPI Teaching and Learning

Robin Munson, Ph.D.
Asst. Superintendent
OSPI Assessment & Student
Information

Ellen Ebert, Ph.D.
Science Director
Teaching and Learning

Thank you!



We respectfully thank you for inviting us to present an update on the Next Generation Science Standards.



Student reviewers – Neah Bay HS

The opportunity is most appreciated.

Our time today...



25 Minutes

- Background and state context
 - Common Core State Standards and Next Generation Science Standards (NGSS)
- Where we have been in science and the move to NGSS
- Next Steps: Timeframes for adoption and implementation
- Science assessment system considerations

15 Minutes

- “So What?” – Voices from the Field

10 Minutes

- Committee questions



Student reviewers – Tacoma MESA

Our directive for developing and revising academic learning standards...



RCW 28A.655.070 : Essential academic learning requirements and assessments – Duties of the Superintendent

(1) The superintendent of public instruction shall develop essential academic learning requirements that identify the knowledge and skills all public school students need to know and be able to do based on the student learning goals in RCW 28A.150.210.

In addition, OSPI shall...

- ***Periodically revise*** the essential academic learning requirements, as needed, based on the student learning goals in **RCW 28A.150.210**.

Definitions



- ***Learning Standards*** represent a body of content, skills, and concepts and are articulated across multiple grade levels related to what all students should know and be able to do throughout grades K-12.
 - The *Next Generation Science Standards* (NGSS) are distinct from prior science standards in that they integrate three dimensions (disciplinary core ideas, science and engineering practices, and crosscutting concepts) within each standard and have intentional connections across standards.
- ***Performance Standards*** represent scores students must meet to earn each level of achievement.
 - While we will talk about assessments today, we won't be discussing performance standards.



Additional Authority since 2009

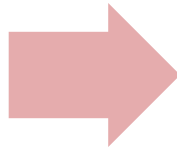
- **RCW 28A.655.071: Common Core State Standards (ELA and Math)** (from ESSB 6696, Section 601)
 - Two reports to the Legislature (January and December 2011)
- **RCW 28A.655.068: Science** (from 2010 ESHB 1410, Section 3, (3))
 - Participation in the development of science standards with a state consortia...

Washington's K-12 Learning Standards Landscape

(CCSS-M, CCSS-ELA, EALRS, GLEs, PEs,)



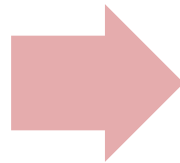
**Washington's
Reading (2005), Writing (2005)
and Math (2008) Standards**



**Common Core State Standards for
English Language Arts and Mathematics**

**Adopted July, 2011
Assessed 2014-15**

**Washington's Science Standards
(2009)**



**Current Standards Continue as WA
Considers the Next Generation Science
Standards (NGSS)**

**NGSS Final Spring 2013
Adoption may occur in Summer 2013
Assessment of NGSS 2016-17,
more likely 2017-18.**

Learning Standards/Guidelines in:

Social Studies

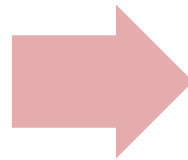
The Arts

Health and Fitness

World Languages

Ed Tech

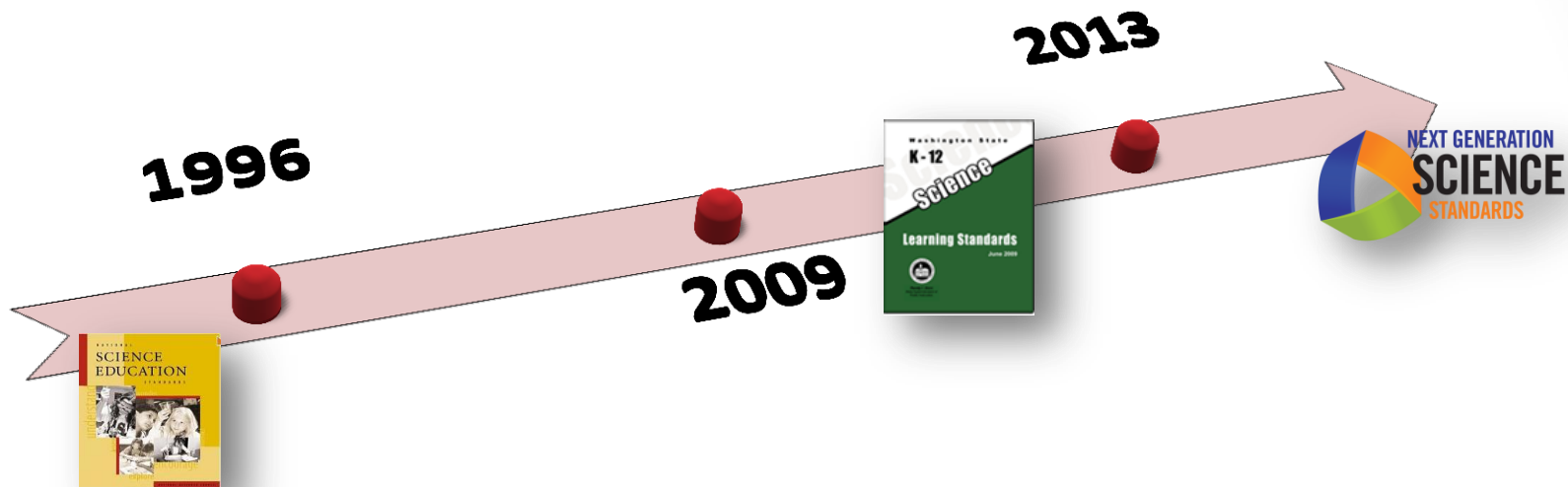
Early Learning and Development, B-Gr.3



Current Standards Continue

**Intentional connections will be made across
subjects focused on building literacy skills
across content areas**

Where we have been in science...

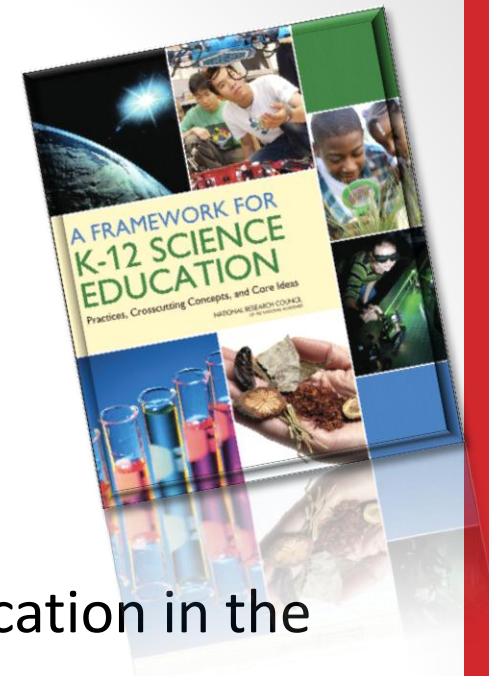


As State Learning Standards change, so does the content of...

- Assessments
- Instructional materials
- Courses and credit requirements
- Educator professional learning



A New Vision for Science Education



A Framework for K-12 Science Education

is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.

A Framework for K-12 Science Education p. 1-2





Principles of the Framework

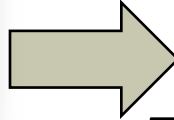
- Children are born investigators
- Understanding builds over time
- Science and Engineering require both knowledge and practice
- Connecting to students' interests and experiences is essential
- Focusing on core ideas and practices
- Promoting equity



NGSS and WA Standards Comparison



Washington (2009)



NGSS (2013)



- **Four Essential Academic Learning Requirements**

1. Systems
2. Inquiry
3. Application
4. Domains
 - Life Science
 - Physical Science
 - Earth and Space Science



- **Three Dimensions**

1. Science and Engineering Practices
 - Subsumes WA Inquiry
2. Disciplinary Core Ideas
 - Life Science
 - Physical Science
 - Earth and Space Science
 - **Engineering and Technology (new)**
 - Subsumes WA Application
3. Crosscutting Concepts
 - Adds 7 crosscutting concepts
 - Subsumes WA Systems and Application

- **Intentional learning progression starting at Kindergarten**

- **Increased STEM opportunities**

NGSS Addresses Equity: “All Standards, All Students”



- **NGSS Diversity and Equity Group**

- Ensures representation of diverse groups of students, avoid unnecessarily difficult language, and avoid bias and stereotypes
- Conducts detailed analysis of NGSS drafts – adjustments made based on bias and sensitivity review
- Writes a stand-alone chapter on how to make NGSS accessible to diverse of students
- Identifies student diversity by beginning with accountability groups defined in No Child Left Behind Act of 2001



Tacoma MESA Students





Kindergarten NGSS Earth Science Example

K-ESS2 Earth's Systems

K-ESS2 Earth's Systems

Students who demonstrate understanding can:

K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.

K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

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
<p>Analyzing and Interpreting Data Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <ul style="list-style-type: none"> Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) <p>Engaging in Argument from Evidence Engaging in argument from evidence in K-2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).</p> <ul style="list-style-type: none"> Construct an argument with evidence to support a claim. (K-ESS2-2) <hr/> <p><i>Connections to Nature of Science</i></p> <p>Science Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> Scientists look for patterns and order when making observations about the world. (K-ESS2-1) 	<p>ESS2.D: Weather and Climate</p> <ul style="list-style-type: none"> Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1) <p>ESS2.E: Biogeology</p> <ul style="list-style-type: none"> Plants and animals can change their environment. (K-ESS2-2) <p>ESS3.C: Human Impacts on Earth Systems</p> <ul style="list-style-type: none"> Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary to K-ESS2-2) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1) <p>Systems and System Models</p> <ul style="list-style-type: none"> Systems in the natural and designed world have parts that work together. (K-ESS2-2)

Connections to other DCIs in this grade-level: will be available on or before April 26, 2013.

Articulation of DCIs across grade-levels: will be available on or before April 26, 2013.

Common Core State Standards Connections: will be available on or before April 26, 2013.

ELA/Literacy –

Mathematics –



Middle School Earth Science Example

MS-ESS2 Earth's Systems

Note Learning Progression from kindergarten

MS-ESS2 Earth's Systems

Students who demonstrate understanding can:

- MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and how they interact to change this process.
- MS-ESS2-2. Construct an explanation based on evidence for how geologic processes have changed Earth's surface at varying time and spatial scales.
- MS-ESS2-3. Analyze and interpret data on the distribution of tectonic plates, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
- MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

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

Developing and Using Models

Modeling in 6-8 builds on K-5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (*MS-ESS1.C GBE*) (*secondary to MS-ESS2-3*)

Crosscutting Concepts

Patterns

- Patterns in rates of change and other numerical relationships can provide information about natural and



High School Earth Science Example

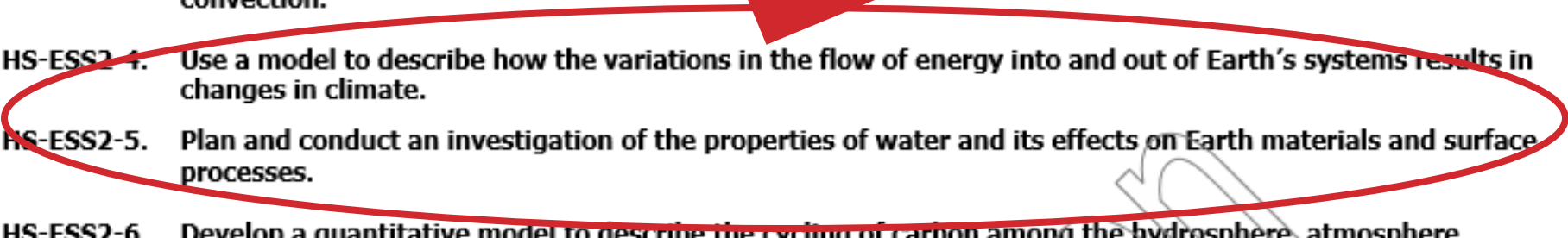
HS-ESS2 Earth's Systems

HS-ESS2 Earth's Systems

Students who demonstrate understanding can:

- HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes, operating over various spatial and temporal scales to form continental and ocean-floor features.
- HS-ESS2-2. Analyze geoscience data to make the claim that changes to one Earth system can create feedbacks that cause changes to other Earth's systems.*
- HS-ESS2-3. Develop a model based on evidence of Earth's internal and surface processes to describe the cycling of matter by thermal convection.*
- HS-ESS2-4. Use a model to describe how the variations in the flow of energy into and out of Earth's systems results in changes in climate.
- HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
- HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Note Learning Progression from middle school



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
Developing and Using Models Modeling in 9-12 builds on K-8 and progresses to using	ESS1.B: Earth and the Solar System • Cyclical changes in the shape of Earth's orbit around the sun	Cause and Effect • Empirical evidence is required to



NGSS Appendix J: Possible Course Maps for Secondary Science (each model assumes 3 years of science)

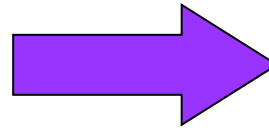
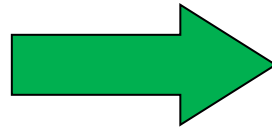
Three model course maps for states to consider:

1. **Conceptual Progressions Model** (6-8 and 9-12) — the 6-8 and 9-12 grade band PEs are organized so that student understanding of concepts is built progressively throughout the course sequence. This is an integrated course model.
2. **Science Domains Model** (6-8 and 9-12) — the 6-8 and 9-12 grade band PEs are organized into content-specific courses that match the three science domains of the Framework: Physical Science, Life Science, and Earth Science with engineering integrated into the courses.
3. **Modified Science Domains Model** (9-12) — the 9-12 grade band performance expectations are organized into content-specific courses that match a common high school course sequence of biology, chemistry, and physics. Earth science is integrated into these courses.

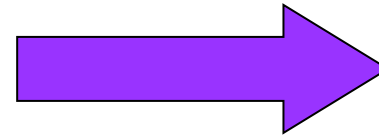
Washington's CCSS and NGSS Timeline & Activities

2011-12 2012-13 2013-14 2014-15 2015-16 2016-17

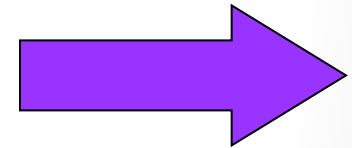
Phase 1: CCSS and NGSS
Exploration



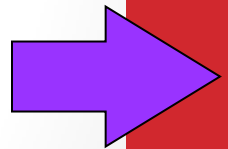
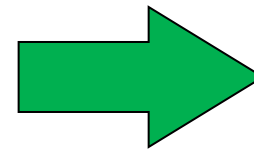
Phase 2: Build Awareness
& Begin Building
Statewide Capacity



Phase 3: Build Statewide
Capacity and Classroom
Transitions



Phase 4: Statewide
Application and
Assessment

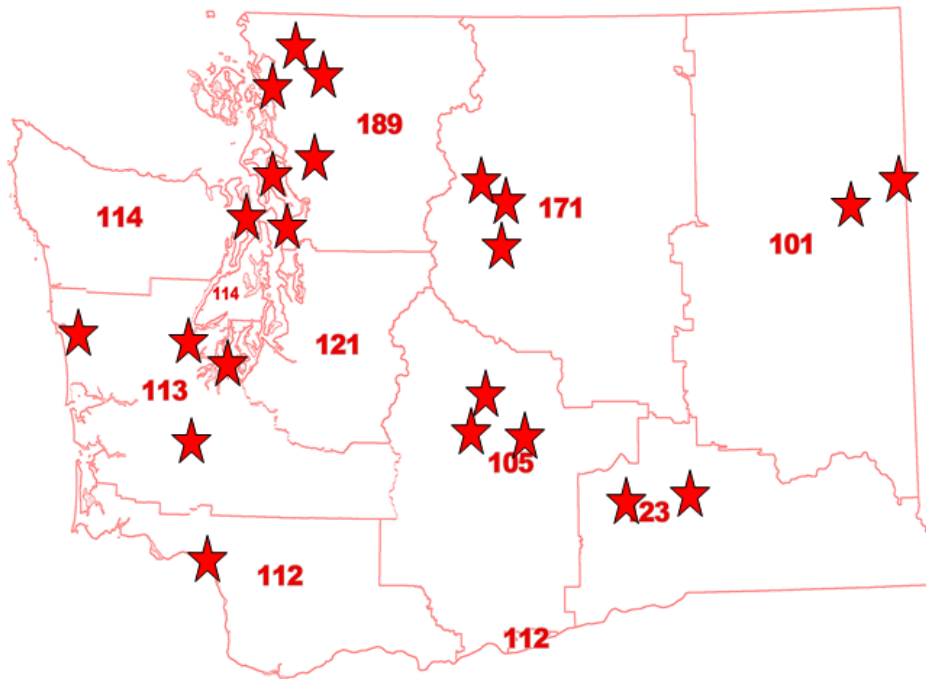


Ongoing: Statewide
Coordination and
Collaboration to Support



Ongoing: Statewide Coordination and Collaboration to Support Implementation

(Professional Learning Providers and Partners Across WA)



Including:

- School Districts
- Higher Education
- Education and Educator Content Associations
- Business Partners



Washington's NGSS Involvement & Process

Summer 2011 to Present



DEVELOPMENT

K-12 Framework for Science Education
NGSS Drafting Process
Confidential Drafts

Summer 2011

WA INVOLVEMENT:

- WA Selected as NGSS Lead State – Fall 2011
- Drafting Process – Fall 2011 – Spring 2012
- Statewide educator, stakeholder input

REVIEW/INPUT

Public Review
Revision Process

WA INVOLVEMENT:

- Statewide educator, stakeholder input
- Student input
- National input
- Comments on Final Drafts

ADOPTION

States have discretion to voluntarily adopt NGSS

**Final Standards
Anticipated late March
2013**

WA STATUS:

BUILD AWARENESS & CAPACITY

State Collaboration and Sharing

WA STATUS:

TRANSITION & APPLICATION

- Intentional transition plans
- Alignment of instructional materials and resources
- Assessment system adjustments

***We are
here***

Key Next Steps Once NGSS are Finalized



- Comparative Analysis (WA and NGSS)
- Bias and Sensitivity process
 - In light of NGSS development process
- Involve / Update key stakeholders – seek support and buy-in
 - Ed. Opportunity Gap Oversight and Accountability Commission
 - Legislative Committees
 - State Board of Education
 - CCSS Steering Committee
 - State Curriculum Advisory and Review Committee
 - Education Associations
- NGSS adoption: Superintendent Dorn

Key Next Steps *Leading to and Following* Adoption



- Transition Planning
 - In context and in conjunction with CCSS 3-year transition plans and partnerships
 - In light of NGSS shifts
 - Current Science Test Map
 - In light of the foundations we have to build on
 - Regional science and STEM activities and supports
 - Math Science Partnerships and other professional development resources
 - Seattle/Renton MSP focuses on NGSS
- State Assessment System Adjustments



Assessment System Transitions

- What effect will NGSS have on assessments (including assessment graduation requirements)?
- How does End-of-Course play into this? Does a Biology EOC even make sense with new standards?
- What is the current thinking about timeframes for implementation, etc.?
- What are the latest discussions about whether there will be consortia-developed assessments?



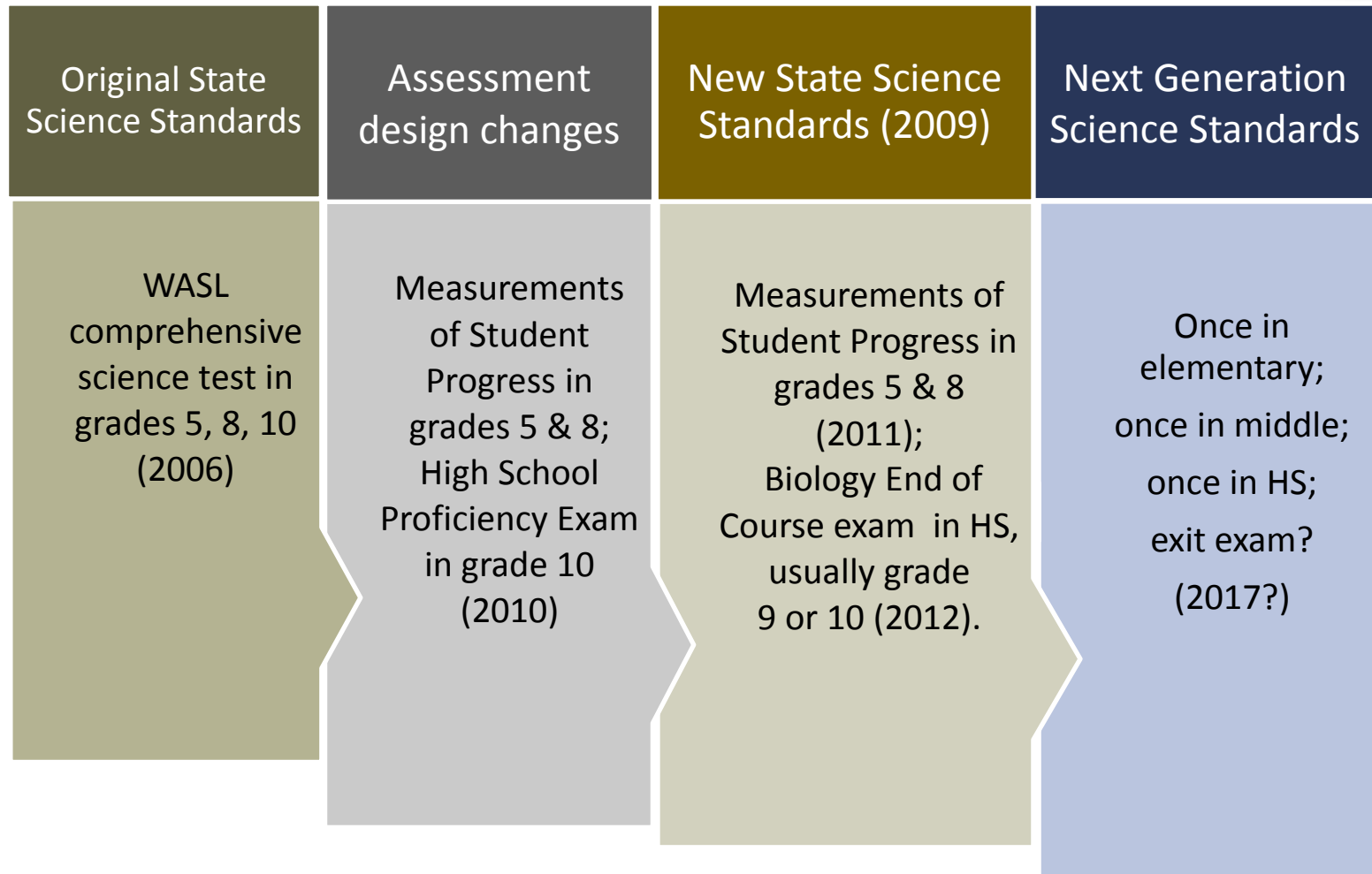
Federal Assessment Requirements

- No Child Left Behind (NCLB) requires that our state's science standards must be assessed:
 - **Once in elementary school** (we give Measurements of Student Progress in 5th grade)
 - **Once in middle school** (we give MSP in 8th grade)
 - **Once in high school** (we give Biology End-of-Course exam)
- When we change our state standards in science we need to change assessments ([RCW 28A.655.070](#)).

State Assessment Requirements

- Additionally, Washington has chosen to add an exit exam requirement for graduation:
 - Students in the Class of 2015 and beyond must pass the Biology EOC, or legislatively approved alternative
 - About half of the states do not have exit exams
- When we change to new standards you will have to decide:
 - If you still want an exit exam
 - If that should be in an end-of-course format
 - If it should just be about biology

Science Assessment Evolution



Assessment Transition for NGSS

- Washington joined a consortium (Smarter Balanced) to minimize the cost of transitioning to new assessments for Common Core:
 - Common Core subjects - only English Language Arts and Mathematics
 - Smarter Balanced assessments - grades 3-8 and 11, beginning in 2014-15.
 - Exit exams for graduation in ELA and Math – pending legislative decision



Assessment Transition, Cont'

- For the NGSS, Washington would like to join a multi-state consortium to minimize the cost of transitioning to new assessments....
- But it is too early to know:
 - What consortia will be available
 - When the assessments would be ready (likely no sooner than 2016-17)
 - What the legislature will decide to do about an exit exam for graduation in Science

Considerations for Exit Exam

- Teachers and students generally like End of Course format.
- But having just one subject (Biology) narrows curriculum.
- Perhaps reduced assessment costs for accountability testing will leave funds for additional content areas (Physical Science, Chemistry, Physics) from which students could choose an exit exam.





Committee Questions

(5 min.)



Student reviewers from Olympia and Thurston County

“So What?”

Why NGSS... the National Perspective



In 2007, a Carnegie Foundation commission of distinguished researchers and public and private leaders concluded that "the nation's capacity to innovate for economic growth and the ability of American workers to thrive in the modern workforce depend on a broad foundation of math and science learning, as do our hopes for preserving a vibrant democracy and the promise of social mobility that lie at the heart of the American dream"¹. However, the U.S. system of science and mathematics education is performing far below par and, if left unattended, will leave millions of young Americans unprepared to succeed in a global economy.

- **Reduction of the United States' competitive economic edge**
- **Lagging achievement of U.S. students**
- **Essential preparation for all careers in the modern workforce**
- **Scientific and technological literacy for an educated society**



“So What?”

Why NGSS...the student perspective... Spokane 6th grader

I reviewed standard: MS Space systems MS-ESS1-A

I really liked/didn't like I liked that it has you make a chart
because you will use models in your career,

I think you should keep the way it is

because I like it.

“So What?”

Why NGSS...the student perspective...Neah Bay HS and MESA HS Students

- I like the standard about the big bang theory, really makes me think. I have always wondered how the universe was created. I like to argue to try to prove my point, everyone likes to argue.
- You get to design and conduct a investigation to generate mathematical comparisons of factors. You get to find the similar ecosystems at different scales.
- Knowing the basic reasoning for production of elements could help me tremendously as I take chemistry based classes in college. Knowing a little more about elements would be very helpful to get me "college ready". Meaning that knowing what stars are made up of and how they are made would be helpful in understanding chemistry at college level.
- It would be cool to design an investigation. You get to observe and find similar ecosystems at difference scales.



“So What?”

Why NGSS...the teacher perspective...opportunities and challenges



Introducing Our Panel Guests

Cheryl Lydon

Science Coordinator, Puget Sound Educational Service District

Maren Johnson

Biology Teacher, Chimacum School District



Roy Tatlonghari

Elementary Instructional Coach
Birney Elementary, Tacoma School District





Committee Questions

(5 min)



Student reviewers from Olympia and Thurston County

Thank you for your time today.



For more information, please contact

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